

Tactical Combat Casualty Care August 2011



Tactical Field Care



OBJECTIVES

- **STATE** the common causes of altered states of consciousness on the battlefield.
- **STATE** why a casualty with an altered state of consciousness should be disarmed.
- **DESCRIBE** airway control techniques and devices appropriate to the Tactical Field Care phase.



OBJECTIVES

- **DEMONSTRATE** the recommended procedure for surgical cricothyroidotomy.
- **LIST** the criteria for the diagnosis of tension pneumothorax on the battlefield.
- **DESCRIBE** the diagnosis and initial treatment of tension pneumothorax on the battlefield.



OBJECTIVES

- **DEMONSTRATE** the appropriate procedure for needle decompression of the chest.
- **DESCRIBE** the progressive strategy for controlling hemorrhage in tactical field care.
- **DEMONSTRATE** the correct application of Combat Gauze.



OBJECTIVES

- **DEMONSTRATE** the appropriate procedure for initiating a rugged IV field setup.
- **STATE** the rationale for obtaining intraosseous access in combat casualties.
- **DEMONSTRATE** the appropriate procedure for initiating an intraosseous infusion.



OBJECTIVES

- **STATE** the tactically relevant indicators of shock in combat settings.
- **DESCRIBE** the pre-hospital fluid resuscitation strategy for hemorrhagic shock in combat casualties.
- **DESCRIBE** the management of penetrating eye injuries in TCCC.
- **DESCRIBE** how to prevent blood clotting problems from hypothermia.



OBJECTIVES

- **DESCRIBE** the appropriate use of pulse oximetry in pre-hospital combat casualty care
- **STATE** the pitfalls associated with interpretation of pulse oximeter readings.
- **LIST** the recommended agents for pain relief in tactical settings along with their indications, dosages, and routes of administration.
- **DESCRIBE** the rationale for early antibiotic intervention in combat casualties.



OBJECTIVES

- **LIST** the factors involved in selecting antibiotic drugs for use on the battlefield.
- **DISCUSS** the management of burns in TFC.
- **EXPLAIN** why cardiopulmonary resuscitation is not generally used for cardiac arrest in battlefield trauma care.
- **DESCRIBE** the procedure for documenting TCCC care with the TCCC Casualty Card.



OBJECTIVES

- **DESCRIBE** the appropriate procedures for providing trauma care for wounded hostile combatants.



Tactical Field Care

- Distinguished from Care Under Fire by:
 - A reduced level of hazard from hostile fire
 - More time available to provide care based on the tactical situation
- Medical gear is still limited to that carried by the medic or corpsman or unit members (may include gear in tactical vehicles)





Tactical Field Care

- May consist of rapid treatment of the most serious wounds with the expectation of a re-engagement with hostile forces at any moment, ***or***
- There may be ample time to render whatever care is possible in the field.
- Time to evacuation may vary from minutes to several hours or longer.



Battlefield Priorities in the Tactical Field Care Phase

- This section describes the recommended care to be provided in TFC.
- **This sequence of priorities shown assumes that any obvious life-threatening bleeding has been addressed in the Care Under Fire phase.**
If this is not the case - address the massive bleeding first.
- After that - care is provided in the sequence shown.



Tactical Field Care Guidelines

1. Casualties with an altered mental status should be disarmed immediately.



Disarm Individuals with Altered Mental Status

- Armed combatants with an altered mental status may use their weapons inappropriately.
- Secure long gun, pistols, knives, grenades, explosives.
- Possible causes of altered mental status are Traumatic Brain Injury (TBI), shock, hypoxia, and pain medications.
- Explain to casualty: “Let me hold your weapon for you while the doc checks you out.”



Tactical Field Care Guidelines

2. Airway Management

a. Unconscious casualty without airway obstruction:

- Chin lift or jaw thrust maneuver**
- Nasopharyngeal airway**
- Place casualty in recovery position**



Tactical Field Care Guidelines

2. Airway Management

b. Casualty with airway obstruction or impending airway obstruction:

- Chin lift or jaw thrust maneuver**
- Nasopharyngeal airway**
- Allow casualty to assume any position that
best**

**protects the airway, to include sitting
up.**

- Place unconscious casualty in recovery
position.**
- If previous measures unsuccessful:**
- Surgical cricothyroidotomy (with
lidocaine if conscious)**



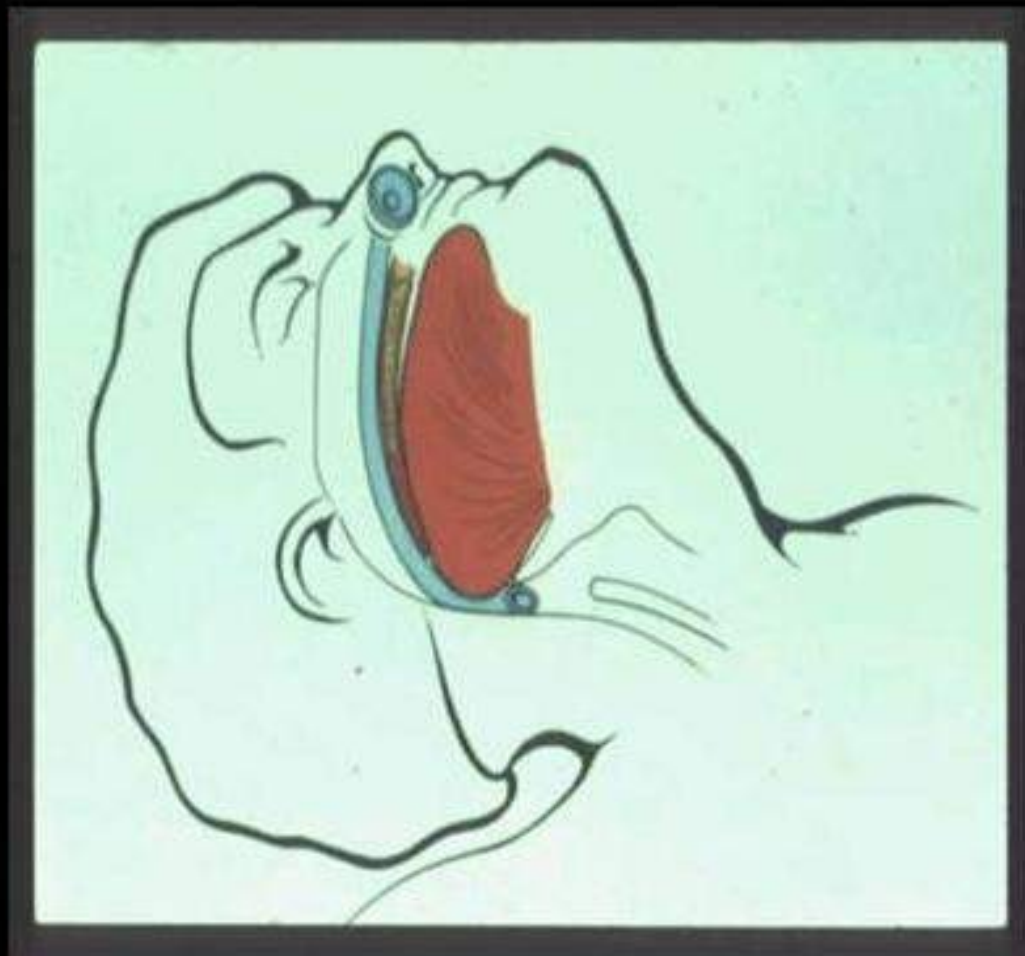
Nasopharyngeal Airway

- The “Nose Hose,” “Nasal Trumpet,” “NPA”
- Excellent success in GWOT
- Well tolerated by the conscious patient
- Lube before inserting
- Insert at 90 degree angle to the face NOT along the axis of the external nose
- Tape it in
- Don't use oropharyngeal airway ('J' Tube)
 - Will cause conscious casualties to gag
 - Easily dislodged



Nasopharyngeal Airway

- **Lubricate !**
- **Insert along floor of nasal cavity**
- **If resistance met, use back-and forth motion**
- **Don't Force – Use other nostril**
- **If patient gags, withdraw slightly**





Nasopharyngeal Airway



What's wrong with this NPA insertion



Maxillofacial Trauma



- Casualties with severe facial injuries can often protect their own airway by sitting up and leaning forward.



Airway Support

Place unconscious casualties in the recovery position after the airway has been opened.

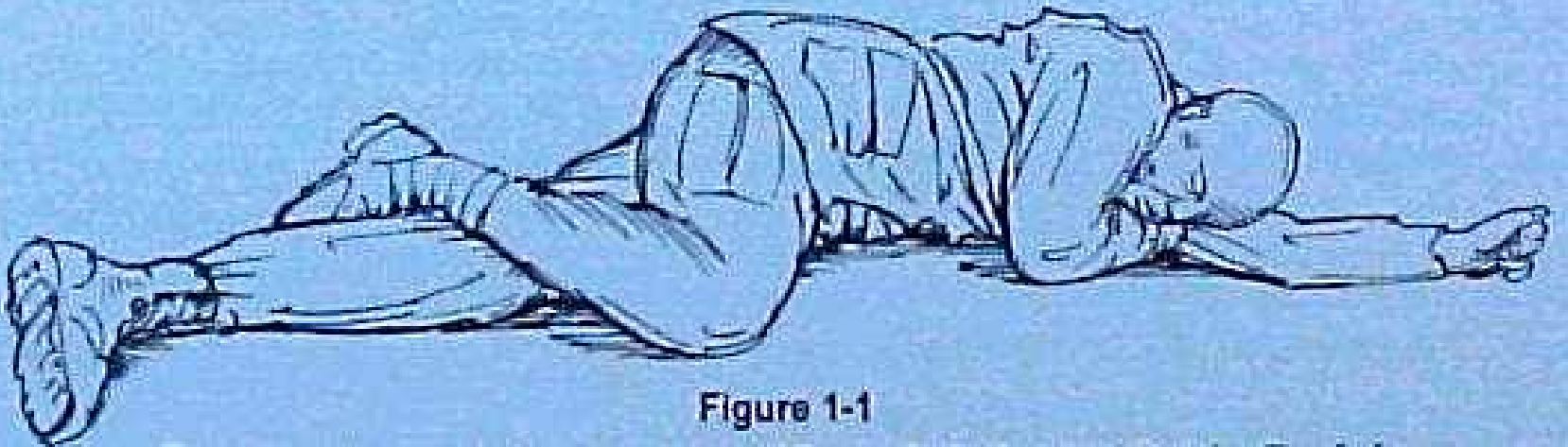


Figure 1-1

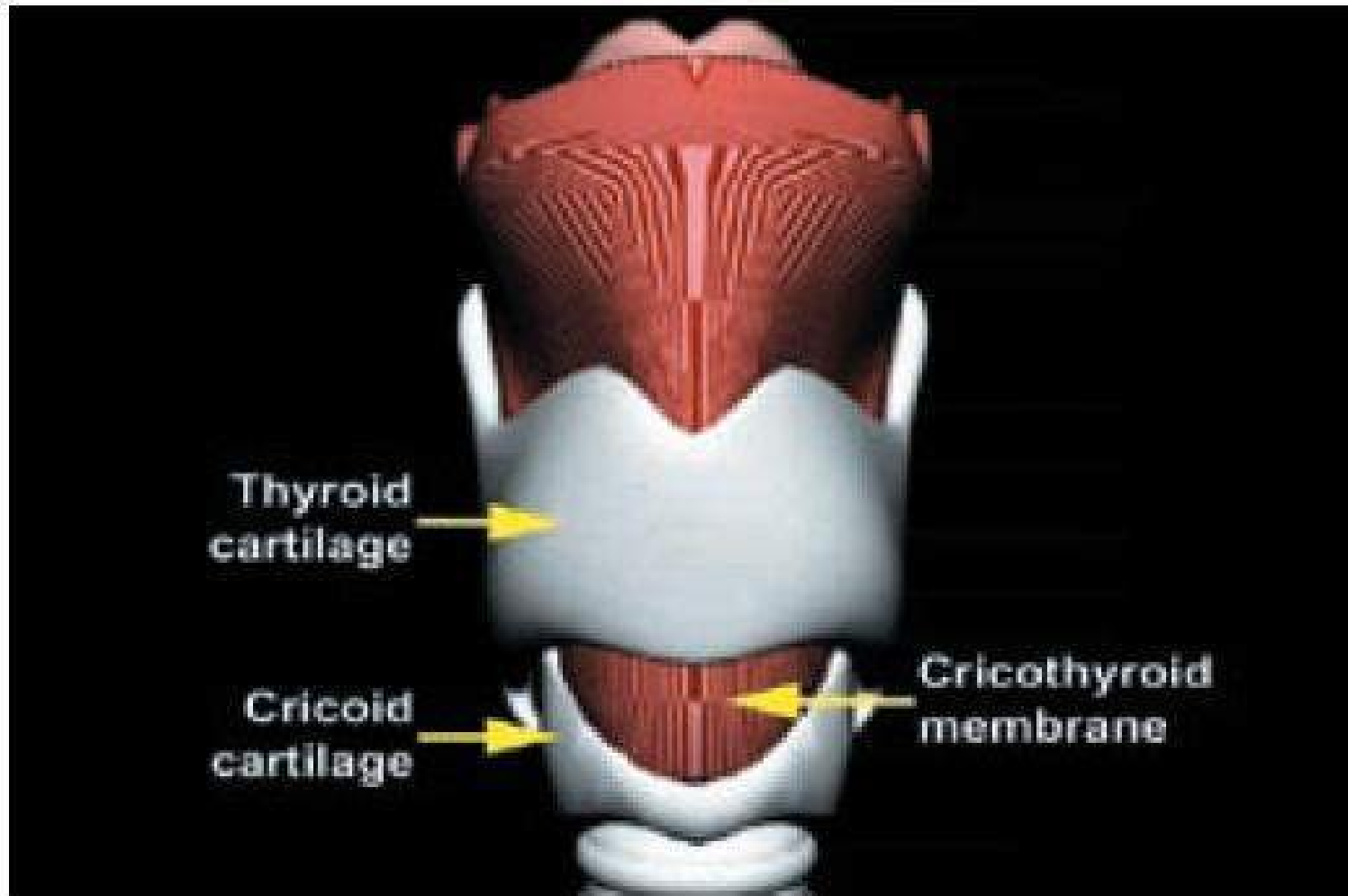


Surgical Airway (Cricothyroidotomy)

- The following series of slides and the video demonstrate a horizontal (transverse) incision technique for performing a surgical airway.
- A vertical (mid-sagittal) incision technique is preferred by many trauma specialists and is recommended in the Iraq/Afghanistan War Surgery textbook.
- Steps are the same except for the orientation of the incision.
- Use a 6.0 tube for the airway



Surgical Airway (Cricothyroidotomy)



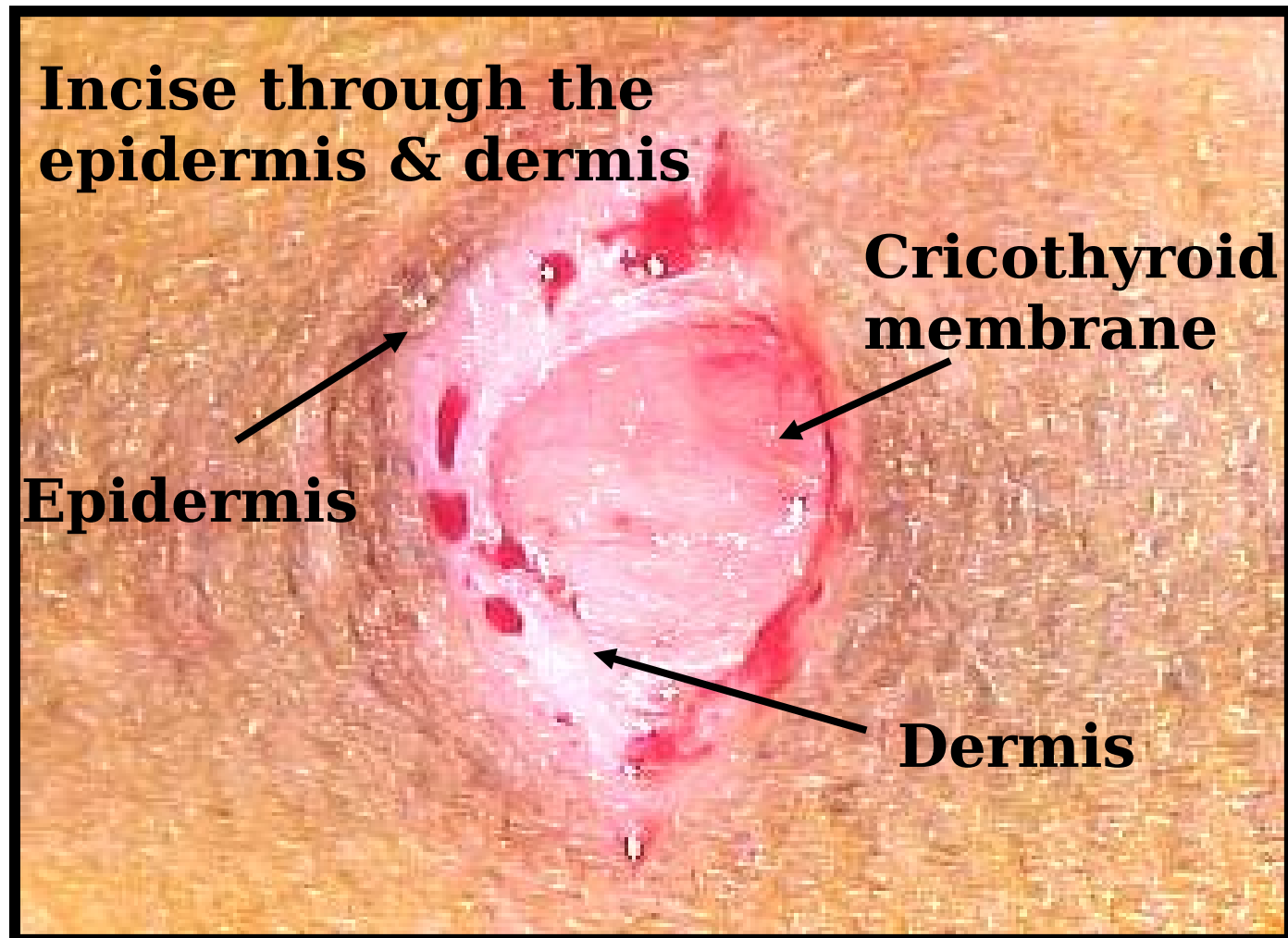


Surgical Incision over Cricothyroid Membrane



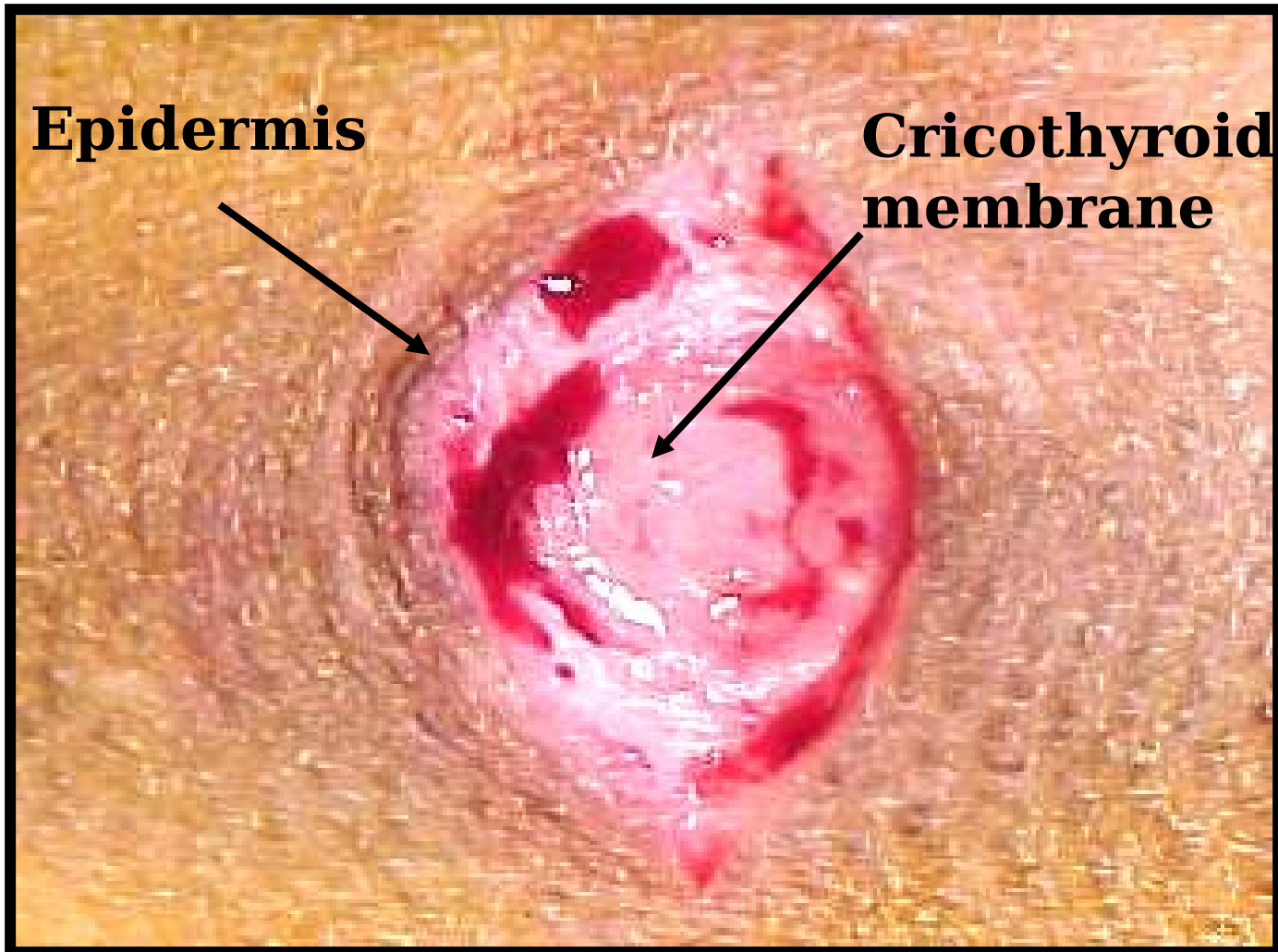


Surgical Airway





Surgical Airway





Surgical Airway



**Single stabbing
incision through
cricothyroid membrane**

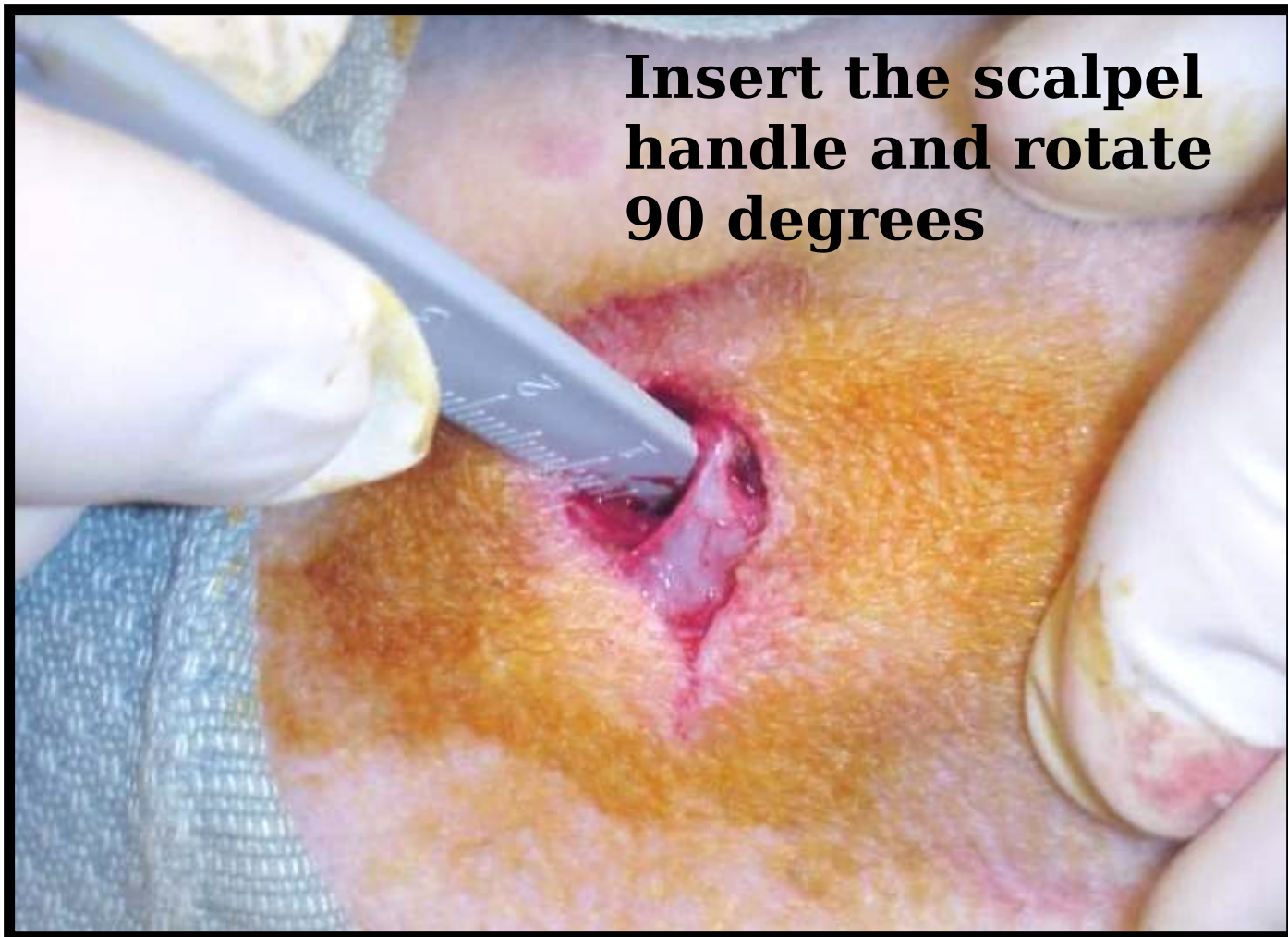


Surgical Airway





Surgical Airway





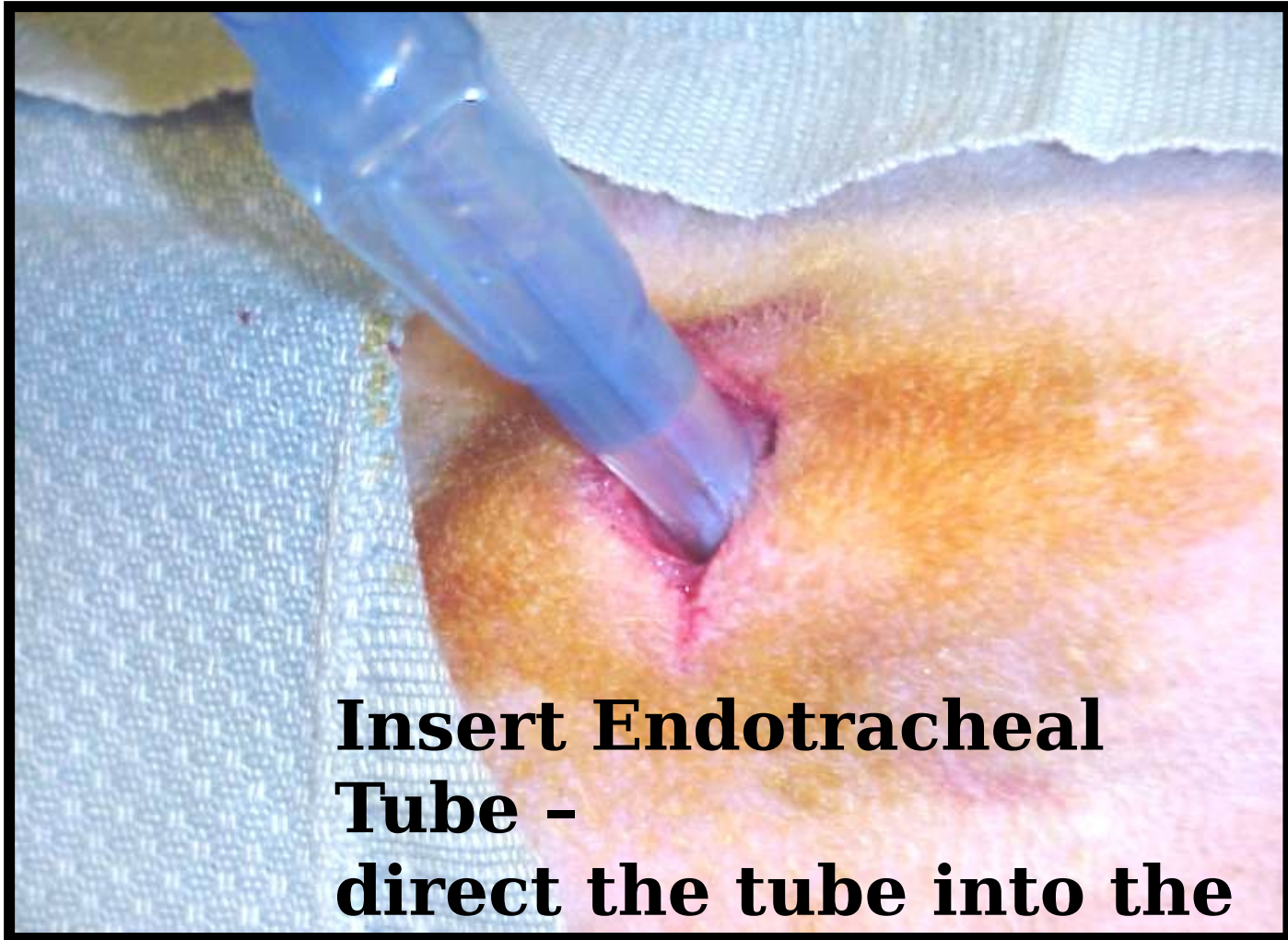
Surgical Airway



**Insert Mosquito
hemostat into
incision and dilate**



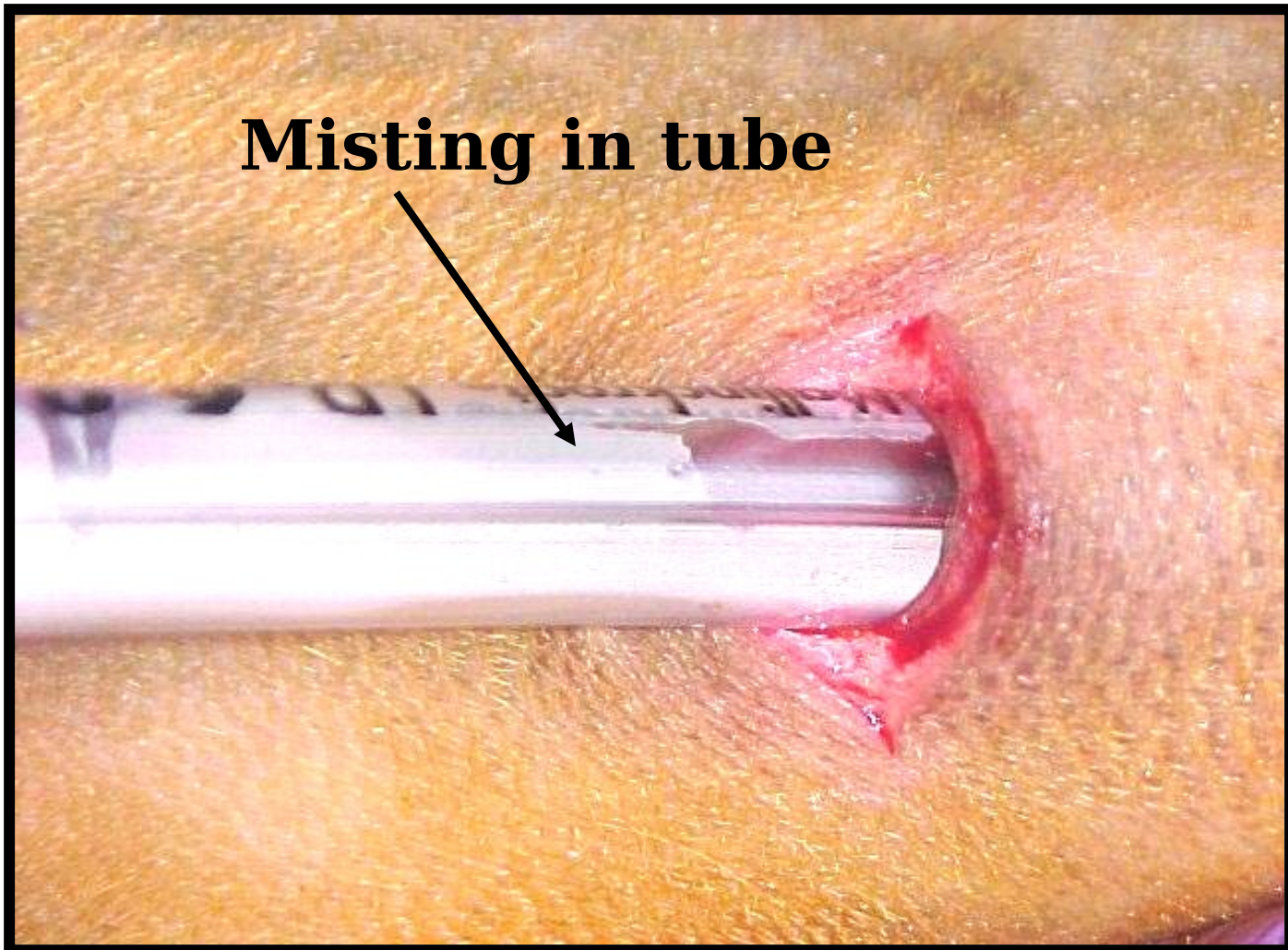
Insert ET Tube



**Insert Endotracheal
Tube -
direct the tube into the
trachea and towards**



Check Placement





Inflating the Cuff



**Inflate cuff
And REMOVE
SYRINGE**

Note: Corpsman/medic may wish to cut ET tube off just above the inflation tube so it won't be sticking out so far.

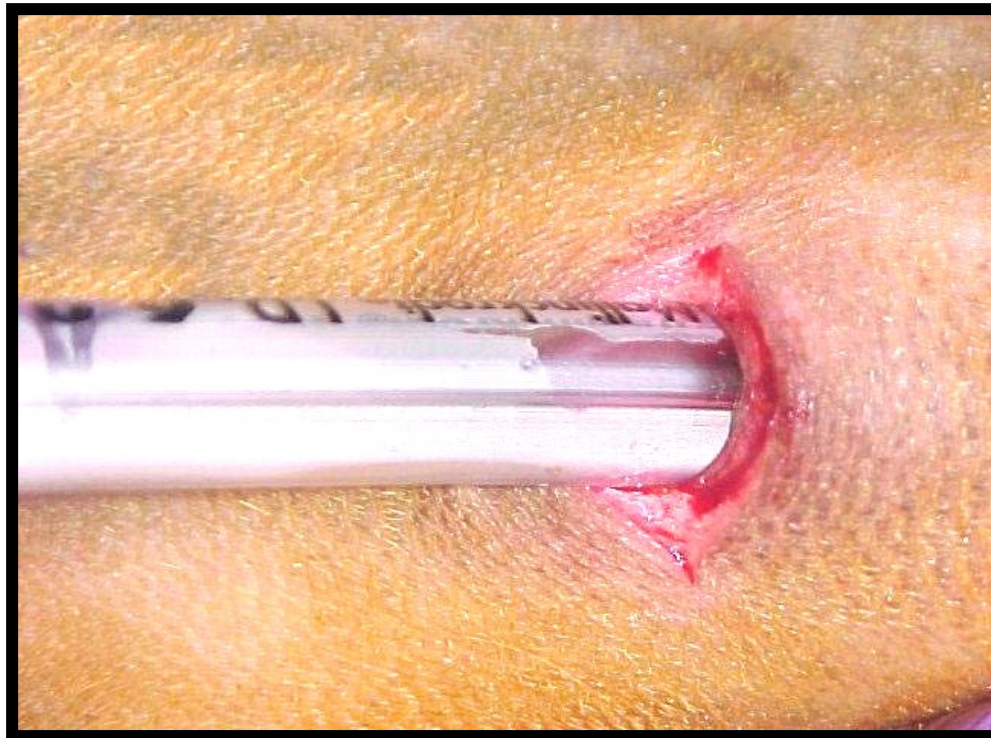


Ventilate





Secure the Tube



At this point, the tube should be taped securely in place with surgical tape.



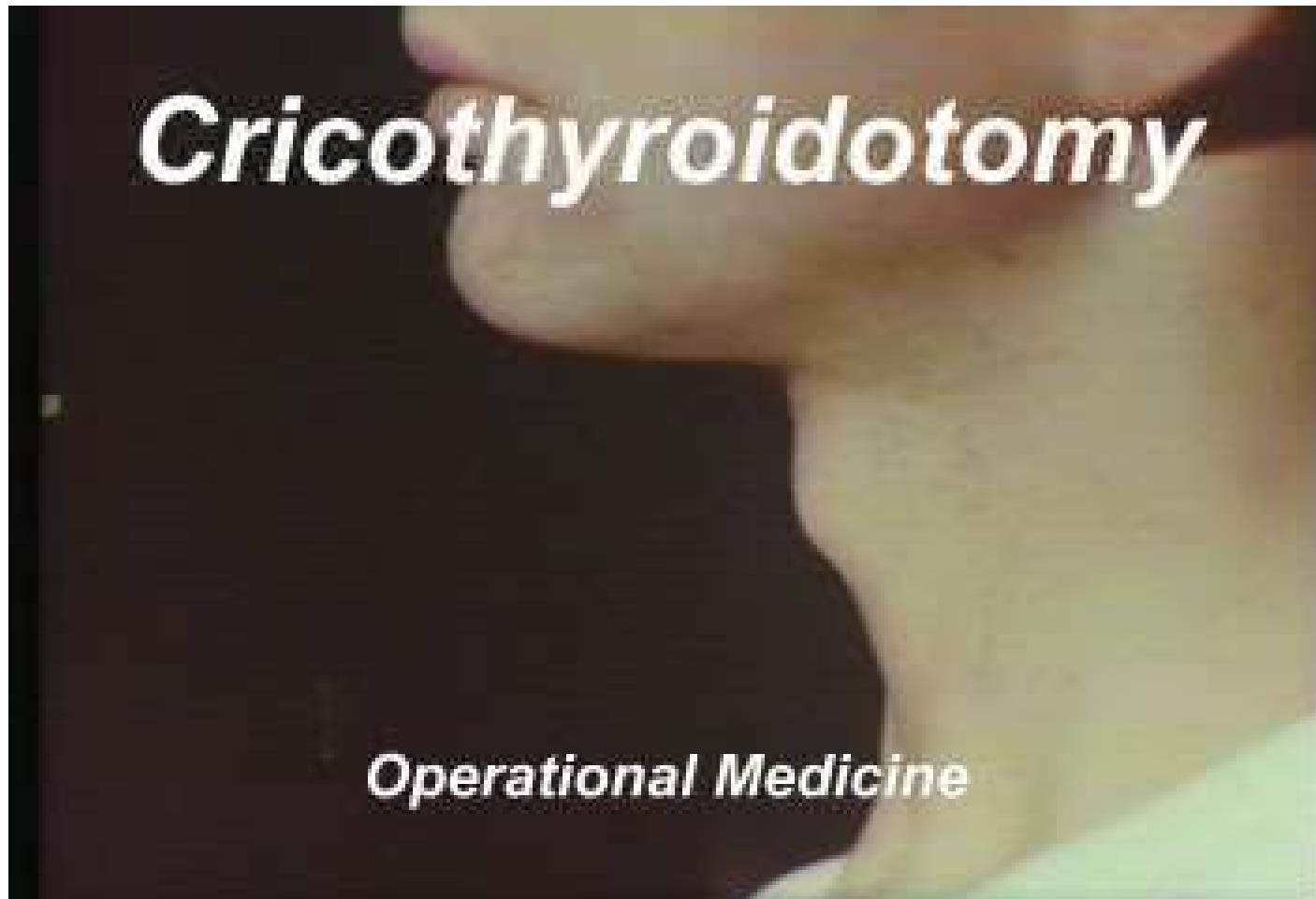
Dress the Wound

Tape a gauze dressing over the surgical airway site.





Surgical Airway Video





An Actual Cricothyroidotomy



Courtesy Dr. Peter Rhee,
Univ. of Arizona

Airway Practical

Nasopharyngeal Airway

Surgical Airway





Tactical Field Care Guidelines

3. Breathing

a. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25-inch needle/catheter unit inserted in the second intercostal space at the midclavicular line. Ensure that the needle entry into the chest is not medial to the nipple line and is not directed towards the heart.



Tactical Field Care Guidelines

3. Breathing

b. All open and/or sucking chest wounds should be treated by immediately applying an occlusive material to cover the defect and securing it in place. Monitor the casualty for the potential development of a subsequent tension pneumothorax.

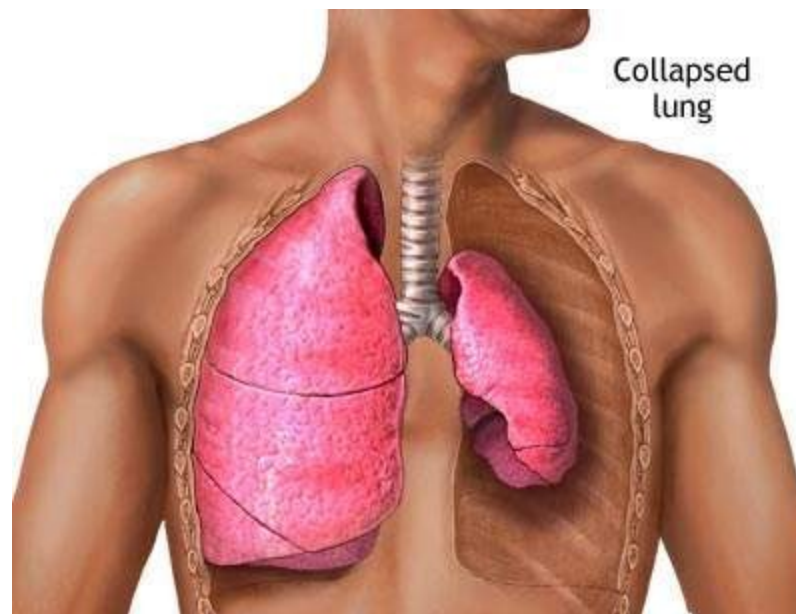


Tension Pneumothorax

- **Tension pneumothorax is another common cause of preventable death encountered on the battlefield.**
- **Easy to treat.**
- Tension pneumo may occur with entry wounds in abdomen, shoulder, or neck.
- Blunt (motor vehicle accident) or penetrating trauma (GSW) may also cause.



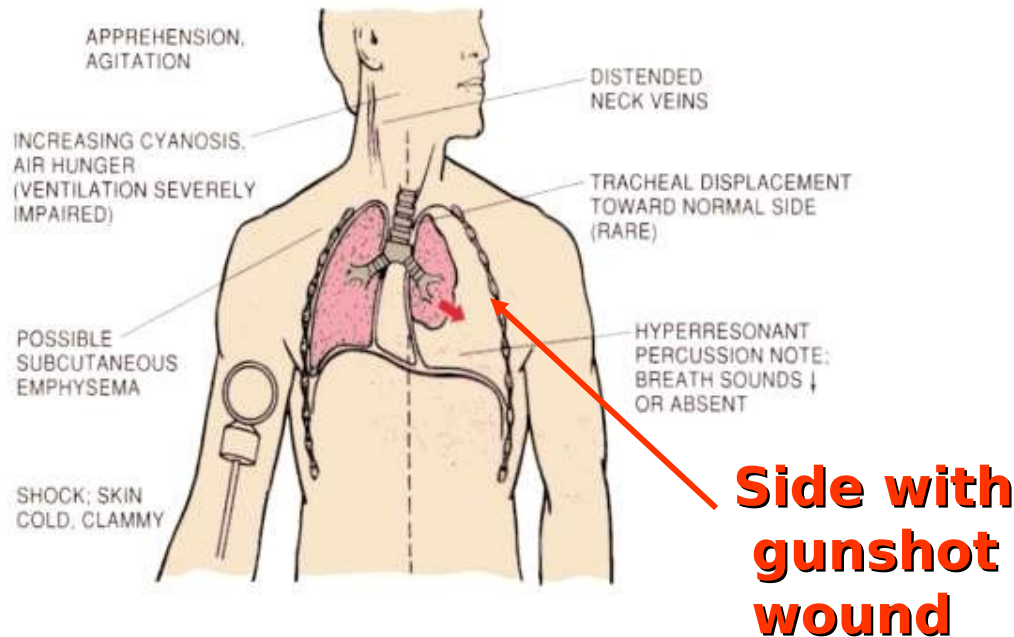
Pneumothorax



A pneumothorax is a collection of air between the lung and chest wall due to an injury to the chest and/or lung. The lung then collapses as shown.



Tension Pneumothorax



A tension pneumothorax is worse. Injured lung tissue acts as a one-way valve, trapping more and more air between the lung and the chest wall.⁴⁴



Tension Pneumothorax

- **Both lung function and heart function are impaired with a tension pneumothorax, causing respiratory distress and shock.**
- Treatment is to let the trapped air under pressure escape.
- Done by inserting a needle into the chest.
- 14 gauge and 3.25 inches long is the recommended needle size.



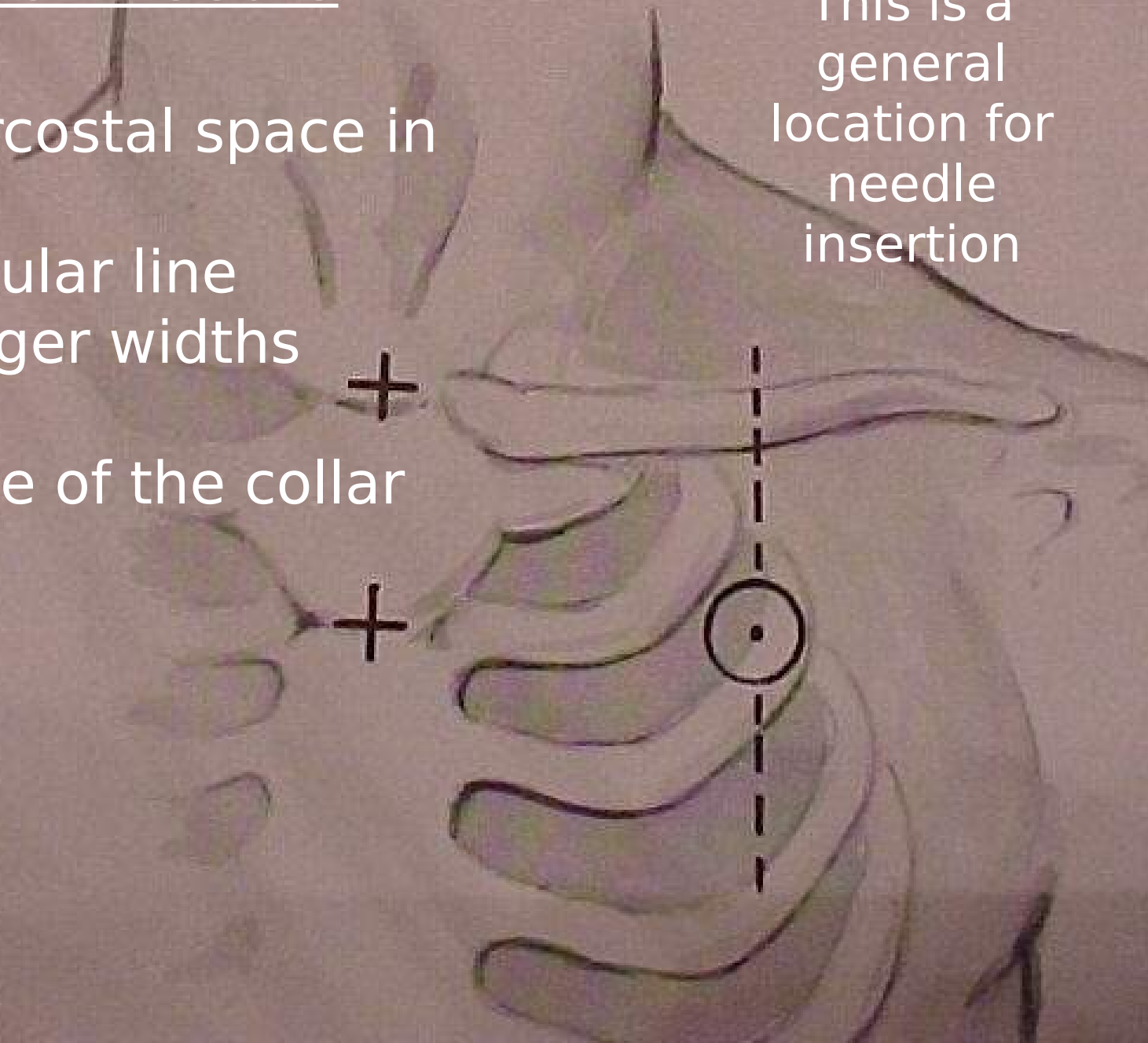
Tension Pneumothorax

- Question: “What if the casualty does not have a tension pneumothorax when you do your needle decompression?”
- Answer:
 - If he has penetrating trauma to that side of the chest, there is already a collapsed lung and blood in the chest cavity.
 - The needle won't make it worse if there is no tension pneumothorax.
 - If he DOES have a tension pneumothorax, you will save his life.

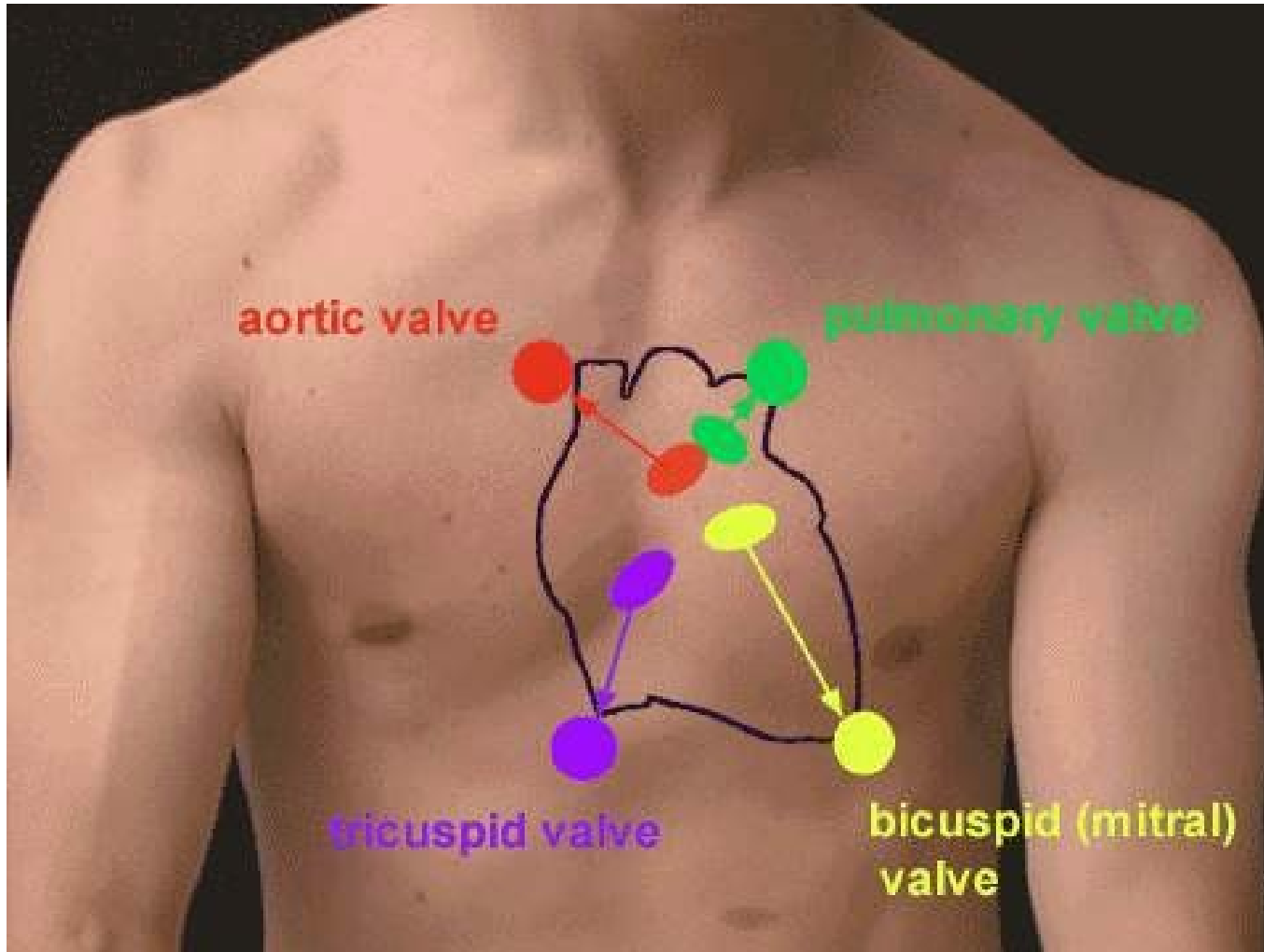
Location for Needle Entry

- 2nd intercostal space in the midclavicular line
- 2 to 3 finger widths below the middle of the collar bone

This is a general location for needle insertion

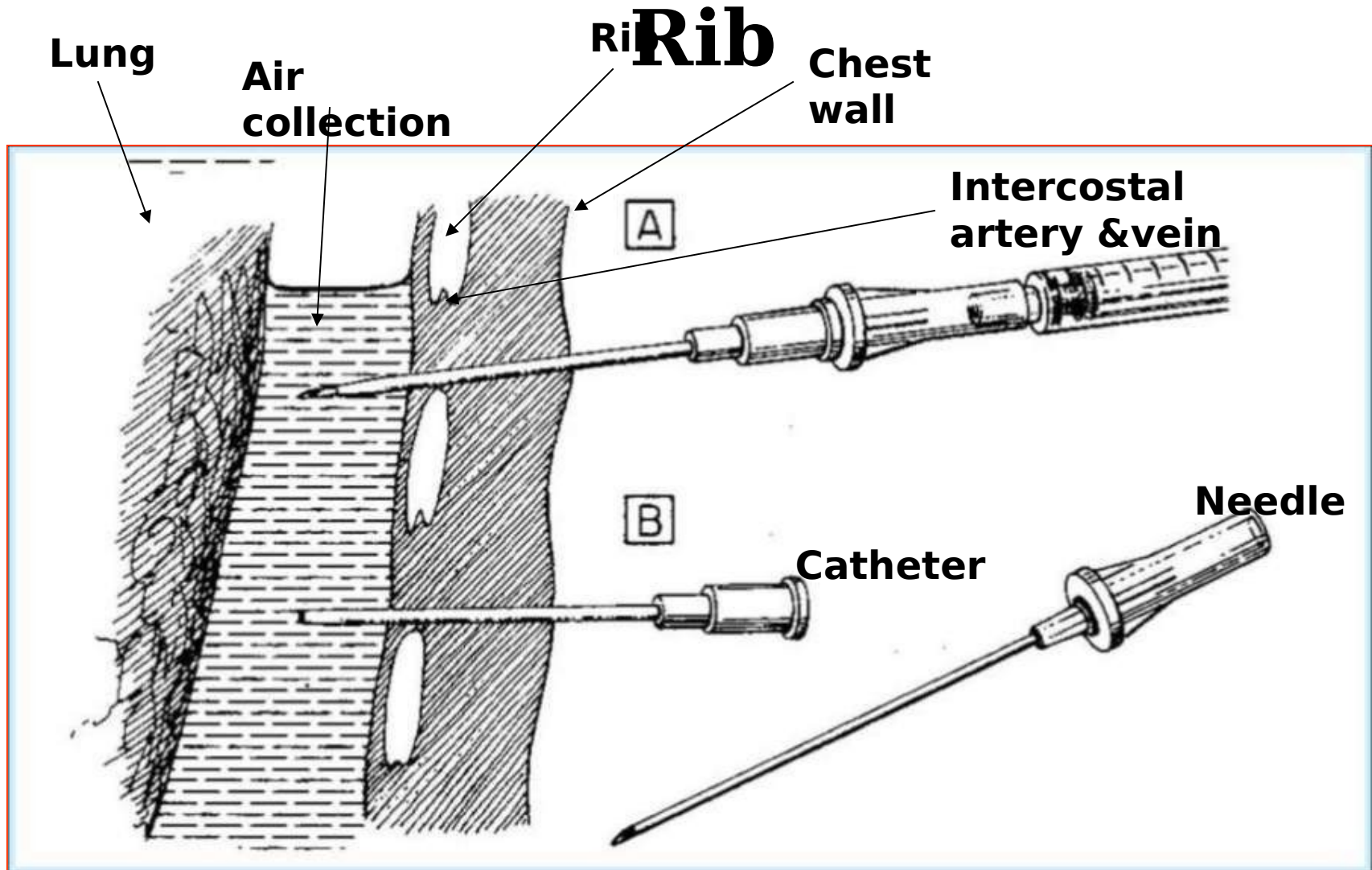


Warning!



- The heart and great vessels are nearby
- Do not insert needle medial to the nipple line or point it towards the heart.

Enter Over the Top of the Third Rib



- This avoids the artery and vein on the bottom of the second



Remember!!

!

- **Tension pneumothorax is a common but easily treatable cause of preventable death on the battlefield.**

- **Diagnose aggressively!**

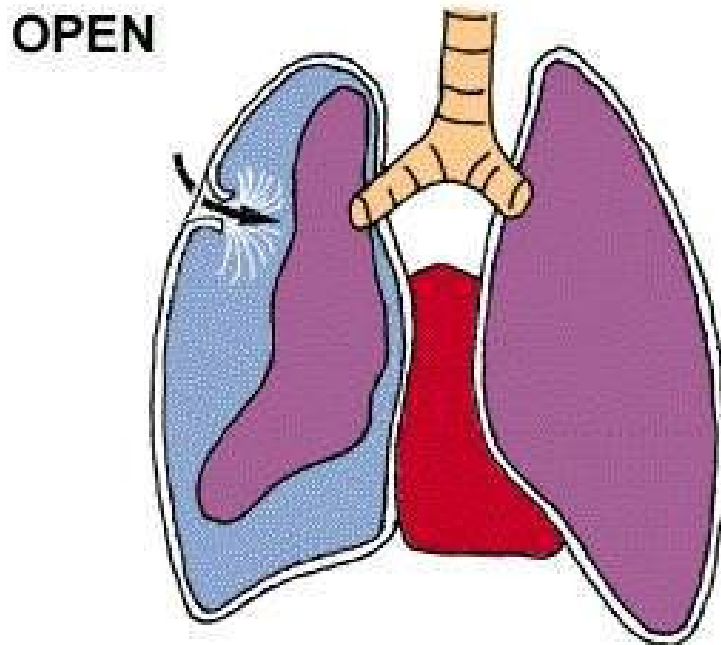




Needle Decompression Practice



Sucking Chest Wound (Open Pneumothorax)



Takes a hole in the chest the size of a nickle or bigger for this to occur.

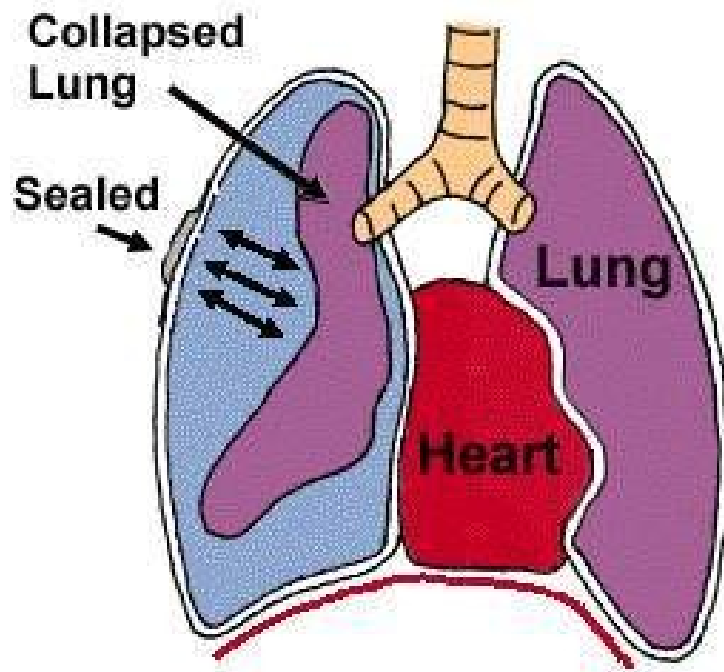


Sucking Chest Wound

- May result from large defects in the chest wall and may interfere with ventilation
- **Treat by applying an occlusive dressing completely over the defect during expiration.**
- Monitor for possible development of subsequent tension pneumothorax.
- Allow the casualty to be in the sitting position if breathing is more comfortable.



Sucking Chest Wound (Treated)



Key Point: If signs of a tension pneumothorax develop - REMOVE the occlusive dressing for a few seconds and allow the tension pneumothorax to decompress!

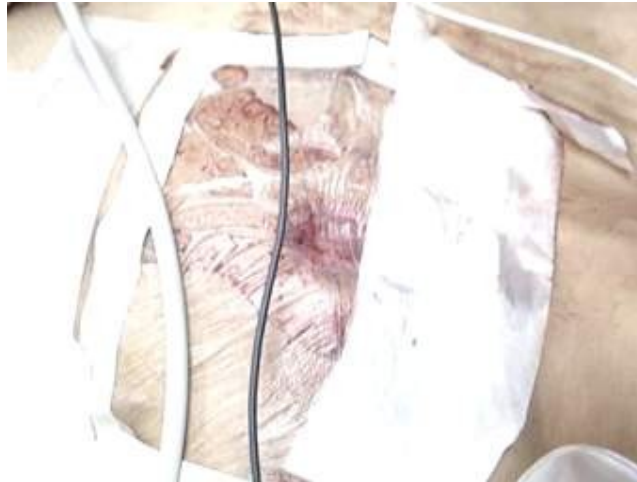


Sucking Chest Wound Video





Sucking Chest Wound (Treated) Video



Questions?





Tactical Field Care Guidelines

4. Bleeding

- a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet application or for any traumatic amputation. Apply directly to the skin 2-3 inches above wound.**



Tactical Field Care Guidelines

4. Bleeding

- b. For compressible hemorrhage not amenable to tourniquet use or as an adjunct to tourniquet removal (if evacuation time is anticipated to be longer than two hours), use Combat Gauze® as the hemostatic agent of choice. Combat Gauze® should be applied with at least 3 minutes of direct pressure. Before releasing any tourniquet on a casualty who has been resuscitated for hemorrhagic shock, ensure a positive response to resuscitation efforts (i.e., a peripheral pulse normal in character and normal mentation if there is no traumatic brain injury (TBI)). **If a lower extremity wound is not amenable to tourniquet application and cannot be controlled by hemostatics/dressings, consider immediate application of mechanical direct pressure, including CoTCCC -recommended devices such as the Combat Ready Clamp (CRoC®).**



Tactical Field Care Guidelines

4. Bleeding

c. Reassess prior tourniquet application. Expose wound and determine if tourniquet is needed. If so, replace tourniquet over uniform with another applied directly to skin 2-3 inches above wound. If tourniquet is not needed, use other techniques to control bleeding.



Tactical Field Care Guidelines

4. Bleeding

d. When time and the tactical situation permit, a distal pulse check should be accomplished. If a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet, side by side and proximal to the first, to eliminate the distal pulse.



Tactical Field Care Guidelines

4. Bleeding

e. Expose and clearly mark all tourniquet sites with the time of tourniquet application. Use an indelible marker.



Tourniquets: Points to Remember

- Damage to the arm or leg is rare if the tourniquet is left on for less than two hours.
- Tourniquets are often left in place for several hours during surgical procedures.
- In the face of massive extremity hemorrhage, it is better to accept the small risk of damage to the limb than to have a casualty bleed to death.



Tourniquets: Points to Remember

- All unit members should have a CoTCCC-approved tourniquet at a standard location on their battle gear.
 - Should be easily accessible if wounded – **DO NOT** bury it at the bottom of your pack
- Tourniquets should be left in their protective packaging until needed to treat casualties.
 - Harsh environments may contribute to tourniquet failure if not left in packaging



Tourniquets: Points to Remember

- Training tourniquets should never be used as mission tourniquets
- Repetitive applications may cause tourniquet failure



Tourniquets: Points to Remember

- When a tourniquet has been applied, **DO NOT** periodically loosen it to allow circulation to return to the limb.
 - Causes unacceptable additional blood loss
 - It HAS been happening, and caused at least one near-fatality in 2005



Tourniquets: Points to Remember

Tightening the tourniquet enough to eliminate the distal pulse will help to ensure that all bleeding is stopped, and that there will be no damage to the tissue with fresh blood entering the limb, but not being able to get out.





Removing the Tourniquet

Do not remove the tourniquet if:

- The extremity distal to the tourniquet has been traumatically amputated.
- The casualty is in shock.
- The tourniquet has been on for more than 6 hours.
- The casualty will arrive at a medical treatment facility within 2 hours after time of application.
- Tactical or medical considerations make transition to other hemorrhage control methods inadvisable.



Removing the Tourniquet

- Consider removing the tourniquet if bleeding can be controlled by other methods.
- Only a combat medic/corpsman/PJ, a PA, or a physician should loosen tourniquets.





Removing the Tourniquet

- Loosen the tourniquet slowly.
 - Observe for bleeding.
- Apply Combat Gauze to the wound per instructions later in the presentation if wound is still bleeding.
- If bleeding remains controlled, cover the Combat Gauze with a pressure dressing.
 - Leave loose tourniquet in place.
- If bleeding is not controlled without the tourniquet, re-tighten it.



TCCC

Hemostatic Agent



QuikClot® Combat Gauze™



Combat Gauze

- Combat Gauze has been shown in lab studies to be more effective than the previous hemostatic agents HemCon® and QuikClot®.
- Both Army (USAISR) and Navy (NMRC) studies confirmed



	QC ACS	HemCon	Celox	WoundStat	Combat Gauze
Hemostatic efficacy	+	+	+++	++++	++++
Side effect	None	None	---	---	None
Ready to use	√	√	√	√	√
Training requirement	+	+	+	+++	++
Lightweight and durable	++	+++	+++	++	+++
2 yrs Shelf life	√	√	√	√	√
Stable in extreme condition	√	√	√	√	√
FDA approved	√	√	√	√	√
Biodegradable	No	No	Yes	No	No
Cost (\$)	~30	~75	~ 25	30- 35	~25



CoTCCC Recommendation

February 2009

- **Combat Gauze is the hemostatic agent of choice.**
- **The previously recommended agent WoundStat[®] has been removed from the guidelines as a result of concerns about its safety.**
- **Additionally, combat medical personnel preferred a gauze-type agent.**



Combat Gauze

- Combat Gauze[™] demonstrated an increased ability to stop bleeding over other hemostatic agents.
- There is no exothermic (heat generating) reaction when Combat Gauze[™] is applied.
- The cost is significantly less than the previously recommended HemCon[®]



Combat GauzeTM

NSN 6510-01-562-3325

- Combat GauzeTM is a 3-inch x 4-yard roll of sterile gauze impregnated with kaolin, a material that causes blood to clot.
- It has been found in lab studies to control bleeding that would otherwise be fatal.





(1) Expose Wound & Identify Bleeding

- Open clothing around the wound.
- If possible, remove excess pooled blood from the wound while preserving any clots already formed in the wound.
- Locate the source of the most active

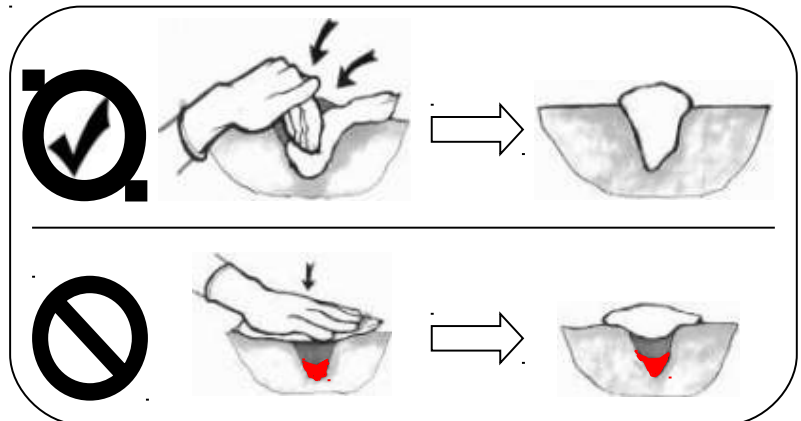




Combat Gauze™ Directions (2)

Pack Wound Completely

- Pack Combat Gauze™ tightly into wound and directly onto the source of bleeding.
- More than one gauze may be required to stem blood flow.
- Combat Gauze™ may be re-packed or adjusted in the wound to ensure proper placement.





Combat Gauze™ Directions (3)

Apply Direct Pressure

- Quickly apply pressure until bleeding stops.
- Hold continuous pressure for 3 minutes.
- Reassess to ensure bleeding is controlled.
- Combat Gauze™ may be repacked or a second gauze used





(4) Bandage over Combat Gauze™

- Leave Combat Gauze™ in place.
- Wrap to effectively secure the dressing in the wound.



Although the Emergency Trauma Bandage is shown in this picture, the wound may be secured with any compression bandage, Ace™ wrap, roller gauze, or cravat.



(5) Transport & Monitor Casualty

- Do not remove the bandage or Combat Gauze™.
- Transport casualty to next level of medical care as soon as possible.





Combat Gauze Video





Direct Pressure

- Can be used as a temporary measure.
- It works most of the time for external bleeding.
- It can stop even carotid and femoral bleeding.
- Bleeding control requires very firm pressure.
- **Don't let up pressure to check the wound until you are prepared to control bleeding with a hemostatic agent or a tourniquet!**
- **Use for 3 full minutes after applying Combat Gauze.**
- It is hard to use direct pressure alone to maintain control of big bleeders while moving the casualty.



**Questions
?**



Combat Gauze™ Practical



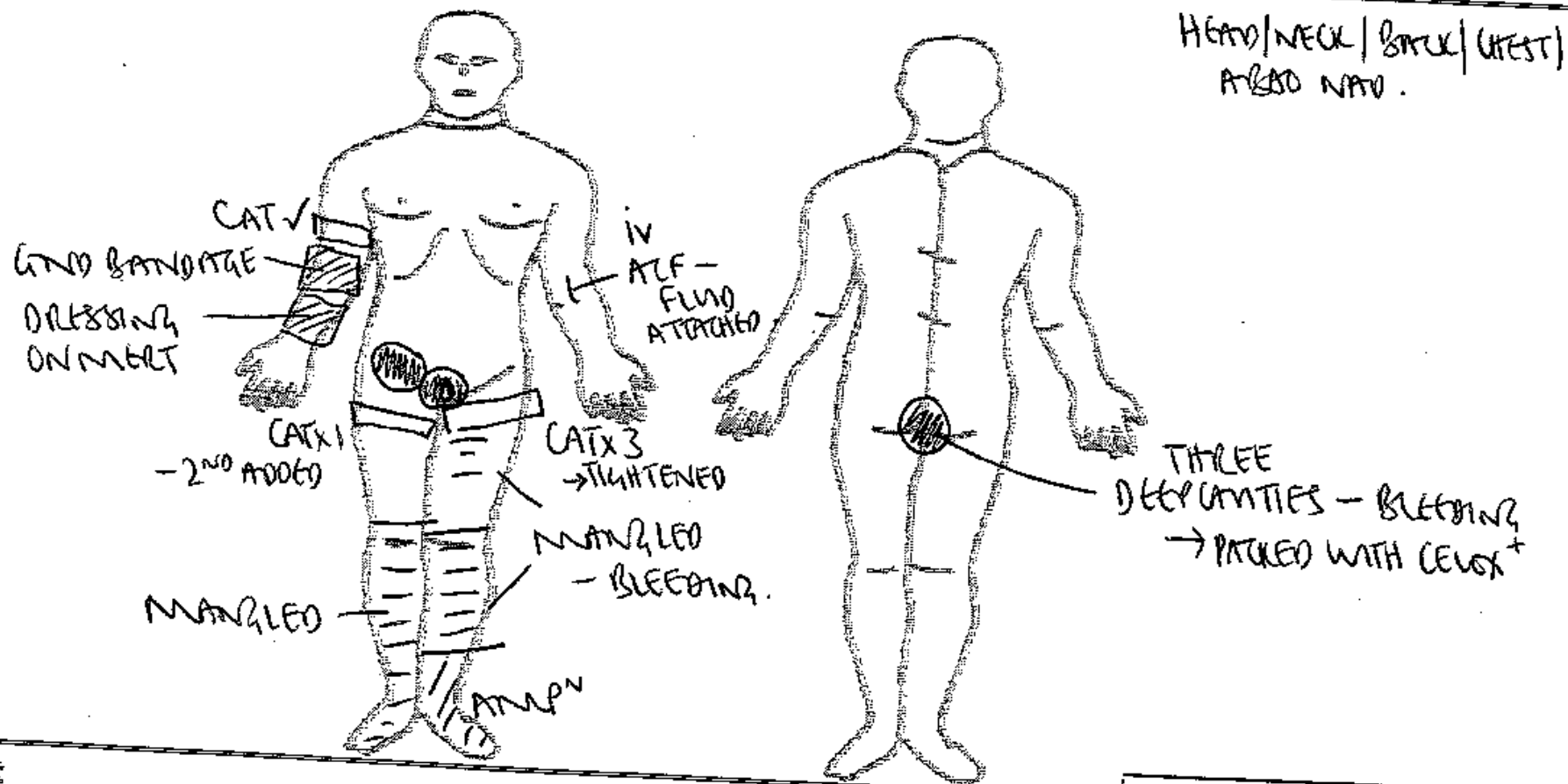


Junctional Hemorrhage

- Term used to include:
 - Groin
 - Buttocks
 - Perineum
 - Axilla
 - Base of neck



Junctional Hemorrhage





Junctional Hemorrhage

“An ongoing USAISR analysis of the cause of death in recent U.S. fatalities from Afghanistan and Iraq has noted that the most common cause of preventable deaths at present is junctional hemorrhage from proximal lower extremity amputations and groin injuries.”

***Eastridge and Mabry
CoTCCC Meeting 3 August 2011***



Junctional Hemorrhage

“Groin hemorrhage is the most common type of junctional bleeding where regular tourniquets cannot work.”

Kelly JF, et al.

J Trauma. 2008; 64(suppl 2)



Wounds that May Result in Junctional Hemorrhage



Typically caused by dismounted IED, attack



Combat Ready Clamp™





Combat Ready ClampTM

- Medic/Corpsman carried device
- Aidbag-based
 - Partially broken-down
 - 1.5 lbs





Assembly of the CRoC



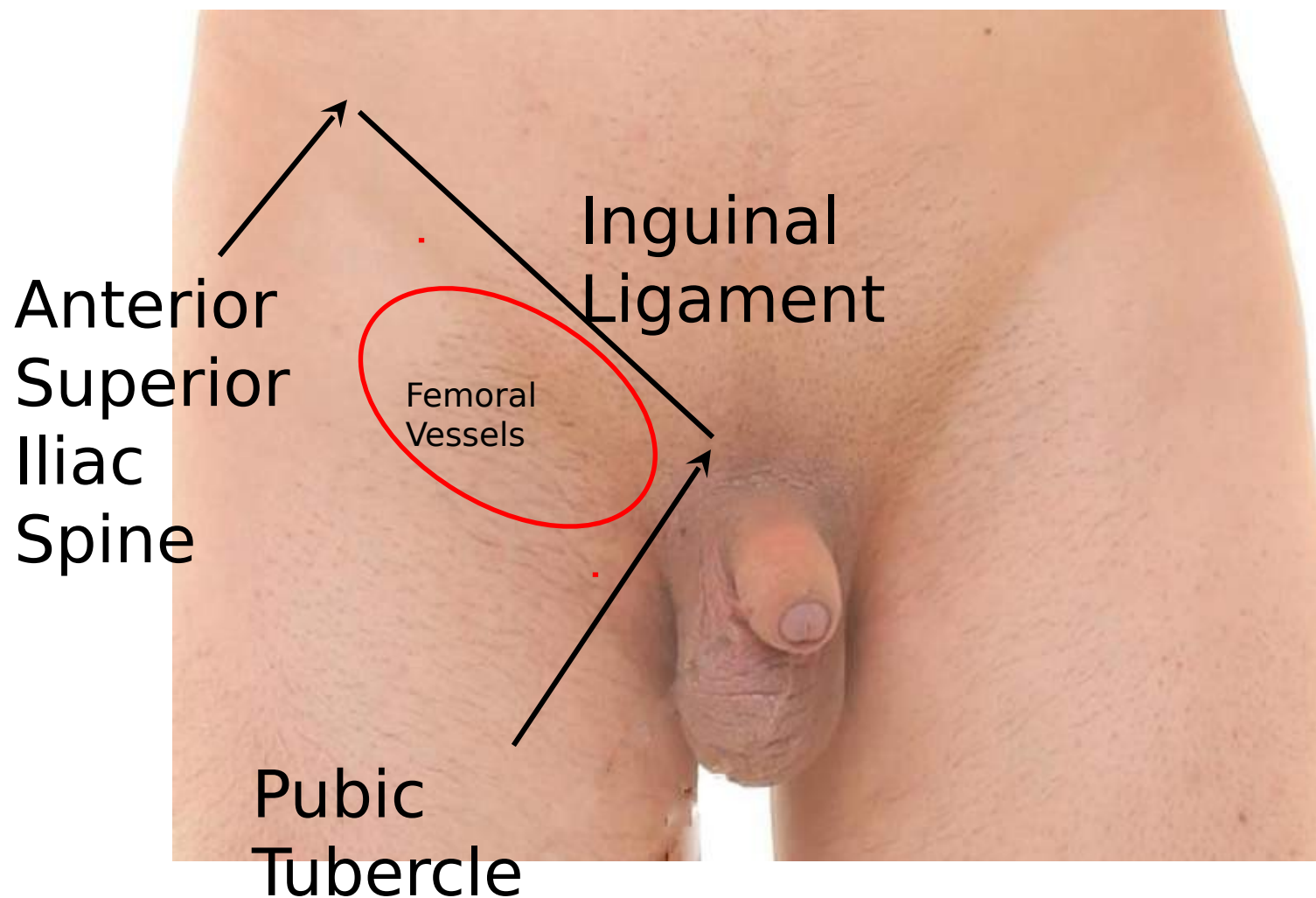


FDA-Approved CRoC Application Points

- **The Combat Ready Clamp is indicated for use on the battlefield to control difficult bleeds in the inguinal area. (FDA approved indication)**
- **Note: The CRoC should NOT be applied above the inguinal ligament.**
- **There are two modes of use for the CRoC:**
 - **Direct pressure: Use directly on the site of external hemorrhage for bleeding sites below the inguinal ligament**
 - **Proximal Pressure: Use at or just below the inguinal ligament to compress the external iliac/femoral artery**

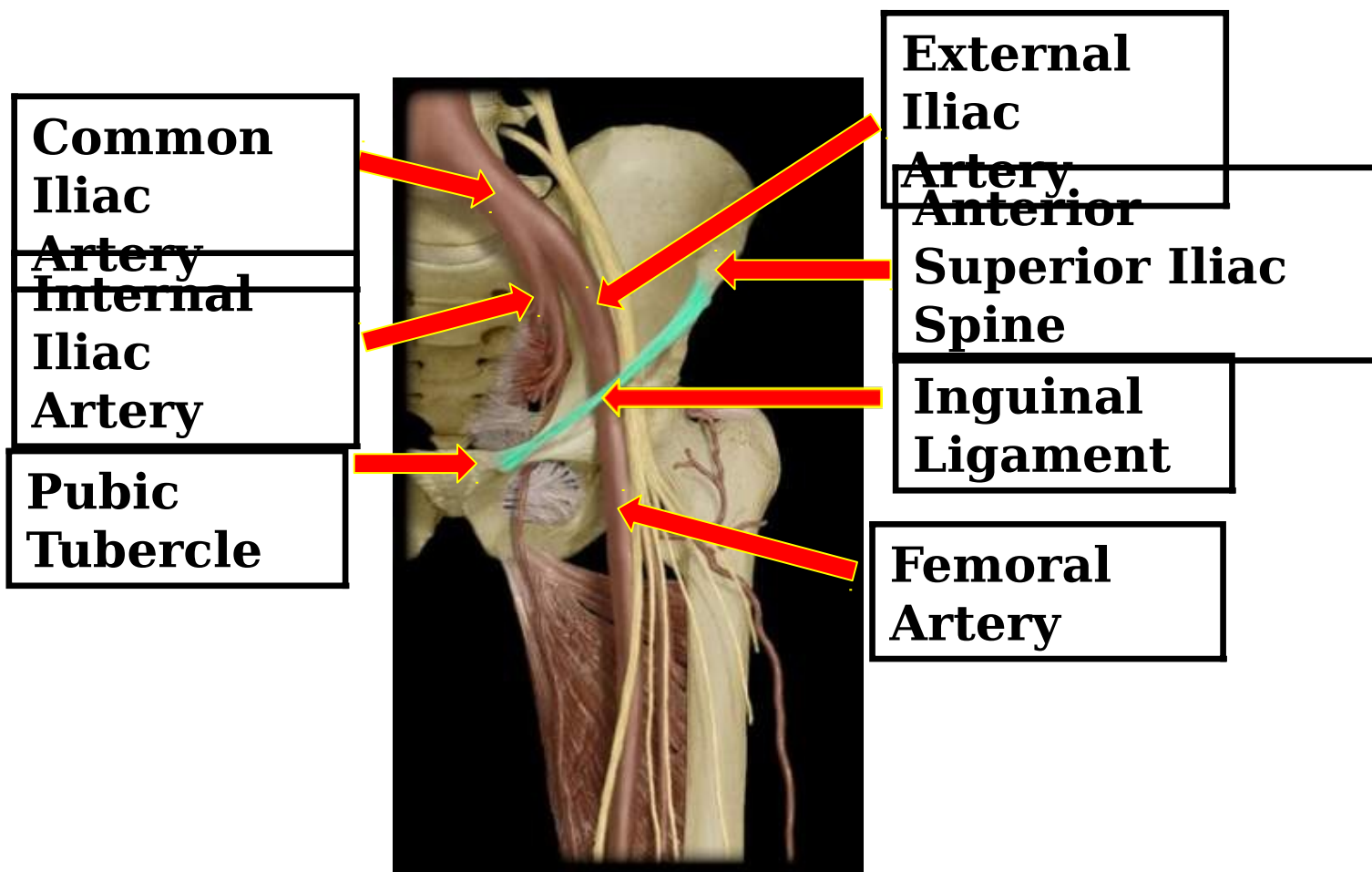


Superficial Anatomy of the Groin





Anatomy of the Inguinal Region



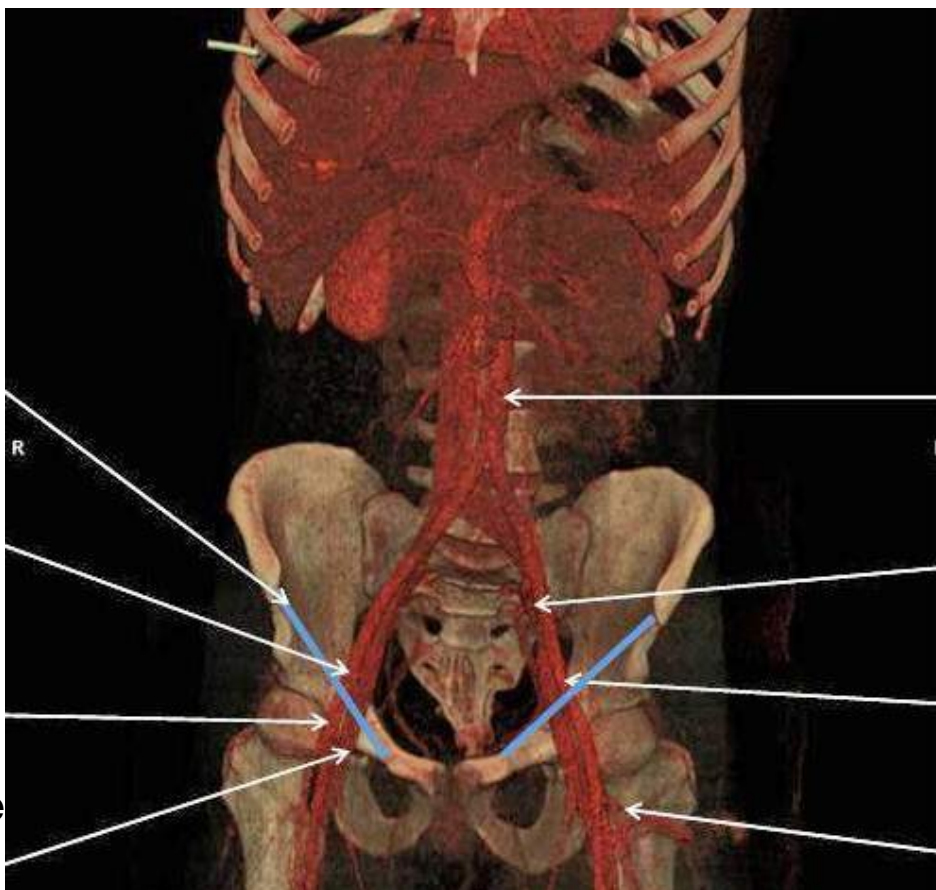


Vascular Anatomy of the Abdomen and Groin

Inguinal Ligament

Ext. iliac a. passing under inguinal lig.

**Common femoral a. passing into the leg
Common femoral vein passing into the leg**



Aorta posterior on the spine

**Int. iliac a. bifurcates from common iliac a.
Ext. iliac a. rising out of pelvis**

Bifurcation of common femoral a. into superficial femoral a. and femoral profunda a.

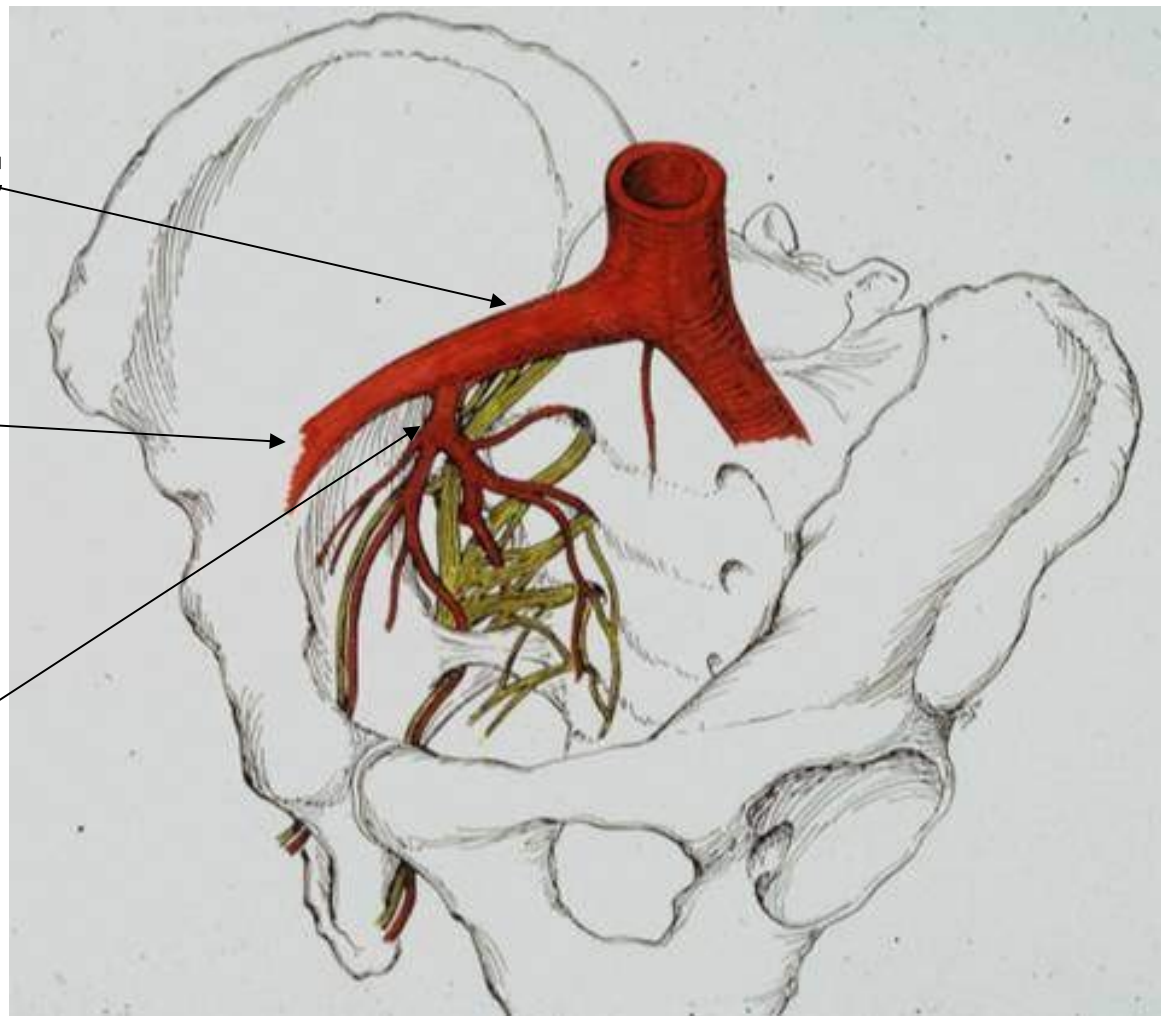


Anatomy of the Iliac Arteries

Common Iliac

External iliac

Internal iliac





CRoC Application: Direct Pressure Method



- Position the base plate under the casualty beneath the desired pressure point.
- Ensure the vertical arm is in contact with the casualty on the wound side in close proximity to the wound location.



CRoC Application: Direct Pressure Method



- Adjust the horizontal arm to position the disc head directly on the location of the most severe bleeding.



CRoC Application: Direct Pressure Method



- Adjust the vertical arm downward to ensure the disc head contacts the casualty directly on the location of the most severe bleeding.



CRoC Application: Direct Pressure Method



- Apply increasing pressure to the most severe bleeding point by turning the “T” handle clockwise.
- Continue increasing the pressure until the bleeding stops.



CRoC Application: Direct Pressure Method



- Attach securing strap.



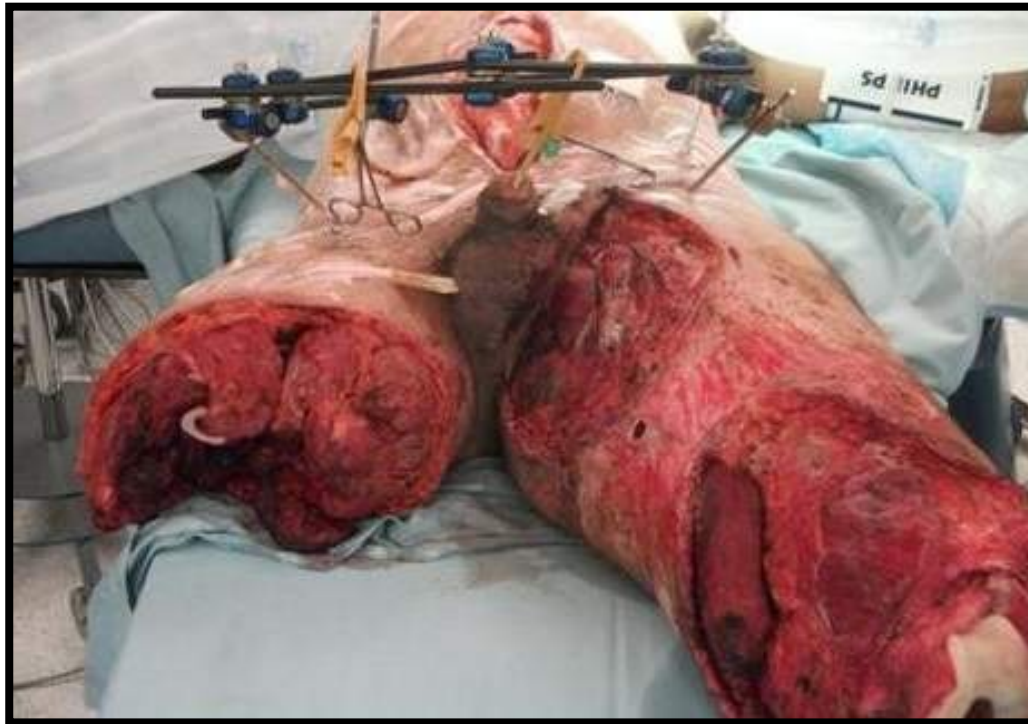
CRoC Application: Direct Pressure Method



- Write the time of application on the label.
- Note time of application on TCCC card.



CRoC Application: Proximal Pressure Method





CRoC Application: Proximal Pressure Method



- **Locate the pubic tubercle.**
- **Locate the anterior superior iliac spine (ASIS).**
- **Between these points is the inguinal fold. Find the mid-point of the line halfway between these two landmarks.**



CRoC Application: Proximal Pressure Method



- **Place the disc head of the CRoC just medial and distal to this midpoint (over the femoral pulse).**
- **Tighten as previously directed.**
- **Ensure that the bleeding has stopped.**



CRoC Application: Proximal Pressure Method



- **Write the time of application on the label.**
- **Note time of application on the TCCC card.**



Litter Positioning of Casualty with CRoC Applied

To get the casualty on a litter:

- Roll the casualty onto the side opposite the CRoC.
- Position the litter behind the casualty.
- Roll or lift casualty onto litter.

Note:

- Ensure that the CRoC does not create additional discomfort for the casualty via his body weight pressing on the device.
- Casualty should be transported on the



CRoC Properly Applied





CRoC Improperly Applied





Continued Reassessment!

- Once applied, the CRoC, as well as the casualty's other hemorrhage control interventions, must be frequently reassessed to assure continued hemorrhage control.
 - **DO NOT EVER APPLY IT AND FORGET IT!**



CRoC Application

CRoC
Training Video



CroC Practical





Tactical Field Care Guidelines

5. Intravenous (IV) access

- Start an 18-gauge IV or saline lock if indicated.**
- If resuscitation is required and IV access is not obtainable, use the intraosseous (IO) route.**



IV Access - Key Point

- **NOT ALL CASUALTIES NEED IVs!**
 - IV fluids not required for minor wounds
 - IV fluids and supplies are limited - save them for the casualties who really need them
 - IVs take time
 - Distract from other care required
 - May disrupt tactical flow - waiting 10 minutes to start an IV on a casualty who doesn't need it may endanger your unit unnecessarily



IV Access

Indications for IV access

- Fluid resuscitation for hemorrhagic shock
or
 - Significant risk of shock – GSW to torso
- Casualty needs medications, but cannot take them PO:
 - Unable to swallow
 - Vomiting
 - Shock
 - Decreased state of consciousness



IV Access

A single 18ga catheter is recommended for access:

- Easier to start than larger catheters
- Minimizes supplies that must be carried
- All fluids carried on the battlefield can be given rapidly through an 18 gauge catheter.
- Two larger gauge IVs will be started later in hospitals if needed.



IV Access - Key Points

- Don't insert an IV distal to a significant wound!
- A saline lock is recommended instead of an IV line unless fluids are needed immediately.
 - Much easier to move casualty without the IV line and bag attached
 - Less chance of traumatic disinsertion of IV
 - Provides rapid subsequent access if needed
 - Conserve IV fluids
- Flush saline lock with 5cc NS immediately and then every 1-2 hours to keep it open



Rugged Field IV Setup (1)

Start a Saline Lock and Cover with Tegoderm® or Equivalent





Rugged Field IV Setup (2) Flush Saline Lock with 5 cc of IV Fluid



**Saline lock must be flushed immediately (within 2
and then flushed every 2 hours if IV fluid is not ru**



Rugged Field IV Setup (3)

Insert Second Needle/Catheter and Connect IV





Rugged Field IV Setup (4)

Secure IV Line with Velcro Strap





Rugged Field IV Setup (5)

Remove IV as Needed for Transport





Questions?



Intraosseous (IO)

Access



If unable to start an IV and fluids or meds are needed urgently, insert a sternal I/O line to



FAST[®] 10 Device





FAST1® Warnings

FAST1® NOT RECOMMENDED IF:

- Patient is of small stature:
 - Weight of less than 50 kg (110 pounds)
 - Less than 12 years old
- Fractured manubrium/sternum - flail chest
- Significant tissue damage at site - trauma, infection
- Severe osteoporosis
- Previous sternotomy and/or scar

**• NOTE: FAST1® INFUSION TUBE
SHOULD NOT BE LEFT IN PLACE FOR
MORE THAN 24 HOURS**



FAST1® Flow Rates

- **30-80 ml/min by gravity**
- **120 ml/min utilizing pressure infusion**
- **250 ml/min using syringe forced infusion**



FAST1[®] Insertion (1)



1. Prepare site using aseptic technique:
 - Betadine
 - Alcohol



FAST[®] 1 Insertion (2)

- Remove backing labeled #1
- Put index finger in sternal notch





FAST¹® Insertion (3)



- Place Target Patch notch under index finger in sternal notch
- Press down firmly over top of Patch
- Remove backing labeled #2, press Patch down firmly



FAST1[®] Insertion (4)



- Place introducer needle cluster in target area
- Assure firm grip
- **Introducer device must be perpendicular to the surface of the manubrium!**



FAST[®] 11 Insertion (5)

- Align introducer perpendicular to the manubrium.
- Insert using increasing pressure till device releases. (~60 pounds)
- Maintain 90 degree alignment to the manubrium throughout.





FAST1[®] Insertion (6)



- Following device release, infusion tube separates from introducer
- Remove introducer by pulling straight back
- Cap introducer using post-use sharps plug and cap supplied



FAST1[®] Insertion (7)



- Connect infusion tube to tube on the target patch
- NOTE: Must flush bone plug with 5 cc of fluid to get flow.
- Assure patency by using syringe to aspirate small bit of marrow.



FAST1[®] Insertion (8)



- Connect IV line to target patch tube
- Open IV and assure good flow
- Place dome to protect infusion site



FAST1[®] Insertion (9)

Potential Problems:

- Infiltration
 - Usually due to insertion not perpendicular to sternum
- Inadequate flow or no flow
 - Infusion tube occluded with bone plug
 - Use additional saline flush to clear the bone plug

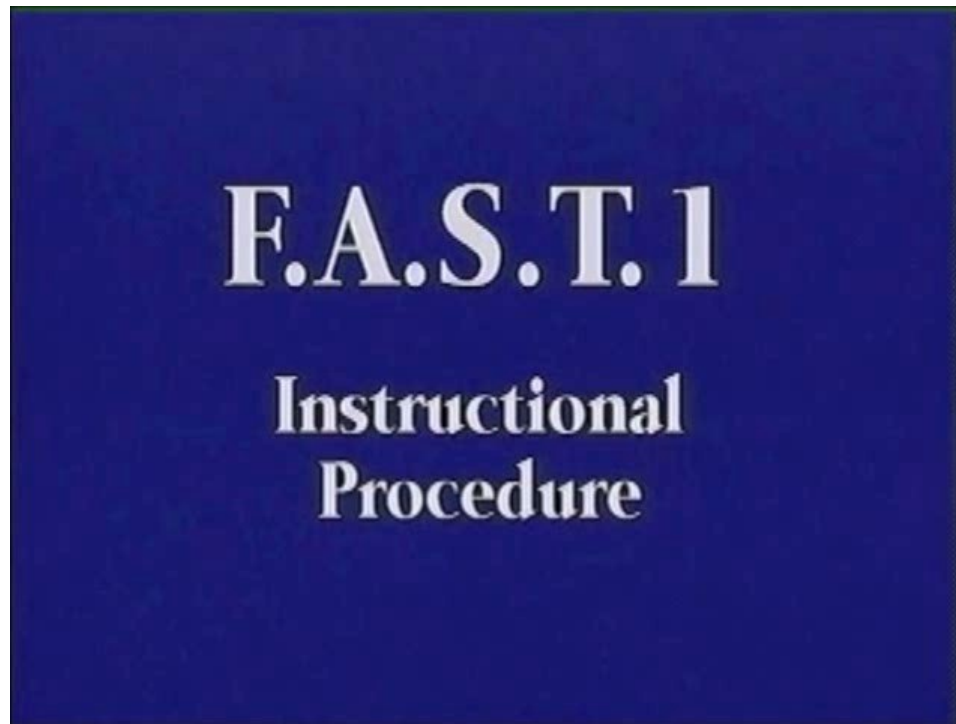


FAST1[®] Access - Key Points

- **DO NOT insert the FAST1[®] on volunteers as part of training - use the training device provided.**
- **Should not have to remove in the field - it can be removed at the medical treatment facility.**



FAST1® Insertion Video



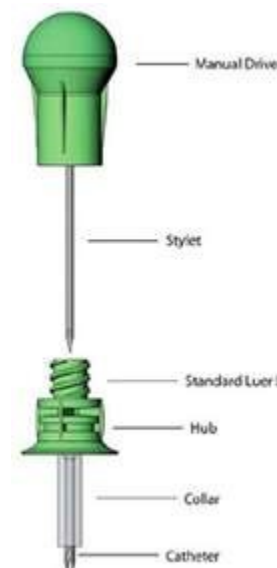
Key Point Not Shown in Video

- Remember to run IV fluids through the IV line before connecting.



EZ-IO[®]

- After Pyng FAST1[®], Vidacare's EZ-IO[®] is the next most commonly used IO device in combat.
- Overall experience with these devices has been favorable.
- Multiple EZ-IO devices are available. It is absolutely essential to use the right device for the chosen anatomical location.





Questions?
IV/IO Practical



Tranexamic Acid (TXA)

6. Tranexamic Acid (TXA)

If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding)

- Administer 1 gram of tranexamic acid (TXA) in 100 cc Normal Saline or Lactated Ringer's as soon as possible but NOT later than 3 hours after injury.
- Begin second infusion of 1 gm TXA after Hextend or other fluid treatment.

*** Note: Per the Assistant Secretary of Defense for Health Affairs memo dated 4 November 2011, use of TXA outside of fixed medical facilities is limited to the Special Operations community.**



TXA

- Hemorrhage is the leading cause of preventable death on the battlefield
- Tourniquets and Combat Gauze do not work for *internal* bleeding
- TXA does!



TXA

- **TXA does not promote new clot formation**
- **Prevents forming clots from being broken down by the body**
- **Helps stop the bleeding**
- **Helps prevent death from hemorrhage**
- **Two major studies have shown a survival benefit from TXA, especially in casualties that require a massive transfusion of blood products**



TXA

- **Survival benefit GREATEST when given within 1 hour of injury**
- **Survival benefit still present when given within 3 hours of injury**
- **DO NOT GIVE TXA if more than 3 hours have passed since the casualty was injured - survival is DECREASED by TXA given after this point**
- ***DON'T DELAY WITH TXA!***



TXA

- **Trade name: Cyklokapron®**
- **FDA-approved**
- **Possible side effects:**
 - **Nausea, vomiting, diarrhea**
 - **Visual disturbances**
 - **Possible increase in risk of post-injury blood clots**
 - **Hypotension if given as IV bolus**



TXA

Storage and Handling

- **Recommended temperature range for storage: 59°-86° F**
- **Must protect this drug from environmental extremes**
- **Store and transport in air conditioned spaces**
- **On missions, carry in small insulated container**
- **In very cold temperatures, carrying TXA next to the body on missions will protect from cold**
- **Carriage in aid bag also acts as insulator against temperature extremes**
- **Return to room temperature storage after each mission**



TXA

Administration - 1st Dose

- **Supplied in 1 gram (1000 mg) ampoules**
- **Should NOT be given with Hextend or through an IV line with Hextend in it**
- **Inject 1 gram of TXA into a 100-cc bag of normal saline or lactated ringer's**
- **Infuse slowly over 10 minutes**
- **Rapid IV push may cause hypotension**
- **If there is a new-onset drop in BP during the infusion - SLOW DOWN the TXA infusion**
- **Then administer blood products or Hextend**



TXA

Administration - 2nd Dose

- **Typically given after the casualty arrives at a Role II/Role III medical facility**
- **May be given in field if evacuation is delayed and fluid resuscitation has been completed before arrival at the medical facility**
- **If still in field or in TACEVAC when fluid resuscitation is complete, give second dose of TXA as directed for the first dose**



Questions?





Tactical Field Care Guidelines

7. Fluid Resuscitation

- **Assess for hemorrhagic shock; altered mental status (in the absence of head injury) and weak or absent peripheral pulses are the best field indicators of shock.**
- a. **If not in shock:**
 - **No IV fluids necessary**
 - **PO fluids permissible if conscious and can swallow**



Tactical Field Care Guidelines

7. Fluid Resuscitation

b. If in shock:

- Hextend, 500ml IV bolus**
- Repeat once after 30 minutes if still**

in shock

- No more than 1000ml of Hextend**



Tactical Field Care Guidelines

7. Fluid Resuscitation

c. Continued efforts to resuscitate must be weighed against logistical and tactical considerations and the risk of incurring further casualties.



Tactical Field Care Guidelines

7. Fluid Resuscitation

d. If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to maintain a palpable radial pulse.



Blood Loss and Shock

What is “Shock?”

- Inadequate blood flow to the body tissues
- Leads to inadequate oxygen delivery and cellular dysfunction
- May cause death
- Shock can have many causes, but on the battlefield, it is typically caused by severe blood loss



Blood Loss and Shock

Question: How does your body react to blood loss?

Answer: It depends - on how much blood you lose.



Normal Adult Blood Volume 5 Liters





500cc Blood Loss

4.5 Liters Blood Volume





500cc Blood Loss

- Mental State: Alert
- Radial Pulse: Full
- Heart Rate: Normal or slightly increased
- Systolic Blood pressure: Normal
- Respiratory Rate: Normal
- Is the casualty going to die from this?

No



1000cc Blood Loss

4.0 Liters Blood Volume





1000cc Blood Loss

- Mental State: Alert
- Radial Pulse: Full
- Heart Rate: 100 +
- Systolic Blood pressure: Normal lying down
- Respiratory Rate: May be normal
- Is the casualty going to die from this?

No



1500cc Blood Loss





1500cc Blood Loss

- Mental State: Alert but anxious
- Radial Pulse: May be weak
- Heart Rate: 100+
- Systolic Blood pressure: May be decreased
- Respiratory Rate: 30
- Is the casualty going to die from this?

Probably not



2000cc Blood Loss

3.0 Liters Blood Volume





2000cc Blood Loss

- Mental State: Confused/lethargic
- Radial Pulse: Weak
- Heart Rate: 120 +
- Systolic Blood pressure: Decreased
- Respiratory Rate: >35
- Is the casualty going to die from this?

Maybe



2500cc Blood Loss

2.5 Liters Blood Volume





2500cc Blood Loss

- Mental State: Unconscious
- Radial Pulse: Absent
- Heart Rate: 140+
- Systolic Blood pressure: Markedly decreased
- Respiratory Rate: Over 35
- Is he going to die from this?

Probably

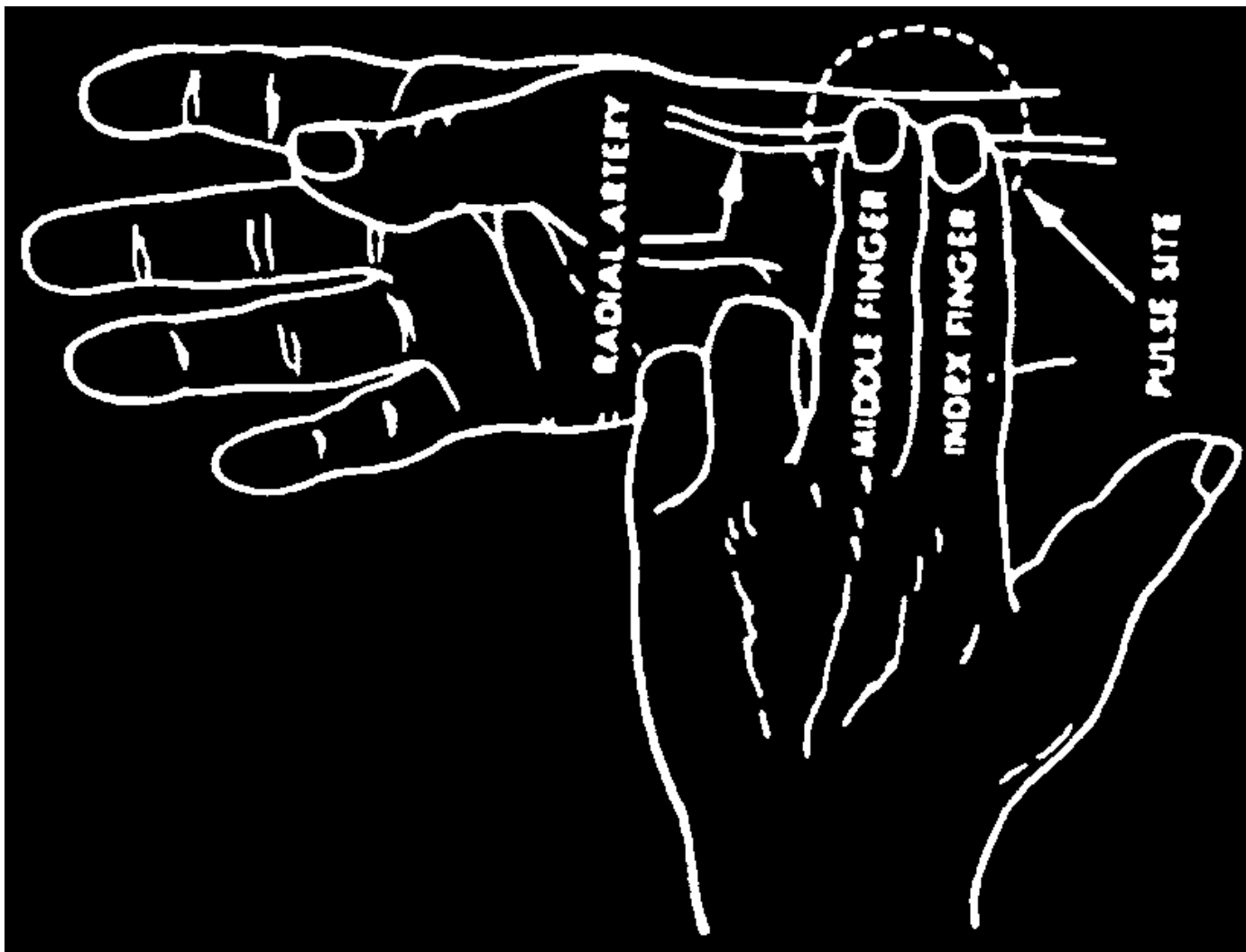


Recognition of Shock on the Battlefield

- Combat medical personnel need a fast, reliable, low-tech way to recognize shock on the battlefield.
- **The best TACTICAL indicators of shock are:**
 - **Decreased state of consciousness** (if casualty has not suffered TBI)
and/or
 - **Abnormal character of the radial pulse** (weak or absent)



Palpating for the Radial Pulse





Fluid Resuscitation Strategy

If the casualty is not in shock:

- **No IV fluids necessary - SAVE IV FLUIDS FOR CASUALTIES WHO REALLY NEED THEM.**
- PO fluids permissible if casualty can swallow
 - Helps treat or prevent dehydration
 - OK, even if wounded in abdomen
 - Aspiration is extremely rare; low risk in light of benefit.
 - Dehydration increases mortality





Hypotensive Resuscitation

Goals of Fluid Resuscitation Therapy

- Improved state of consciousness (if no TBI)
- Palpable radial pulse corresponds roughly to systolic blood pressure of 80 mm Hg
- Avoid over-resuscitation of shock from torso wounds.
- **Too much fluid volume may make internal hemorrhage worse by “Popping the Clot.”**



Choice of Resuscitation Fluid in the Tactical Environment

- Why use Hextend instead of the much less expensive Ringer's Lactate used in civilian trauma?
- 1000ml of Ringers Lactate (2.4 pounds) will yield an expansion of the circulating blood volume of only about 200ml one hour after the fluid is given.
- **The other 800ml of RL has left the circulation after an hour and entered other fluid spaces in the body - FLUID THAT HAS LEFT THE CIRCULATION DOES NOT HELP TREAT SHOCK AND MAY CAUSE OTHER PROBLEMS.**



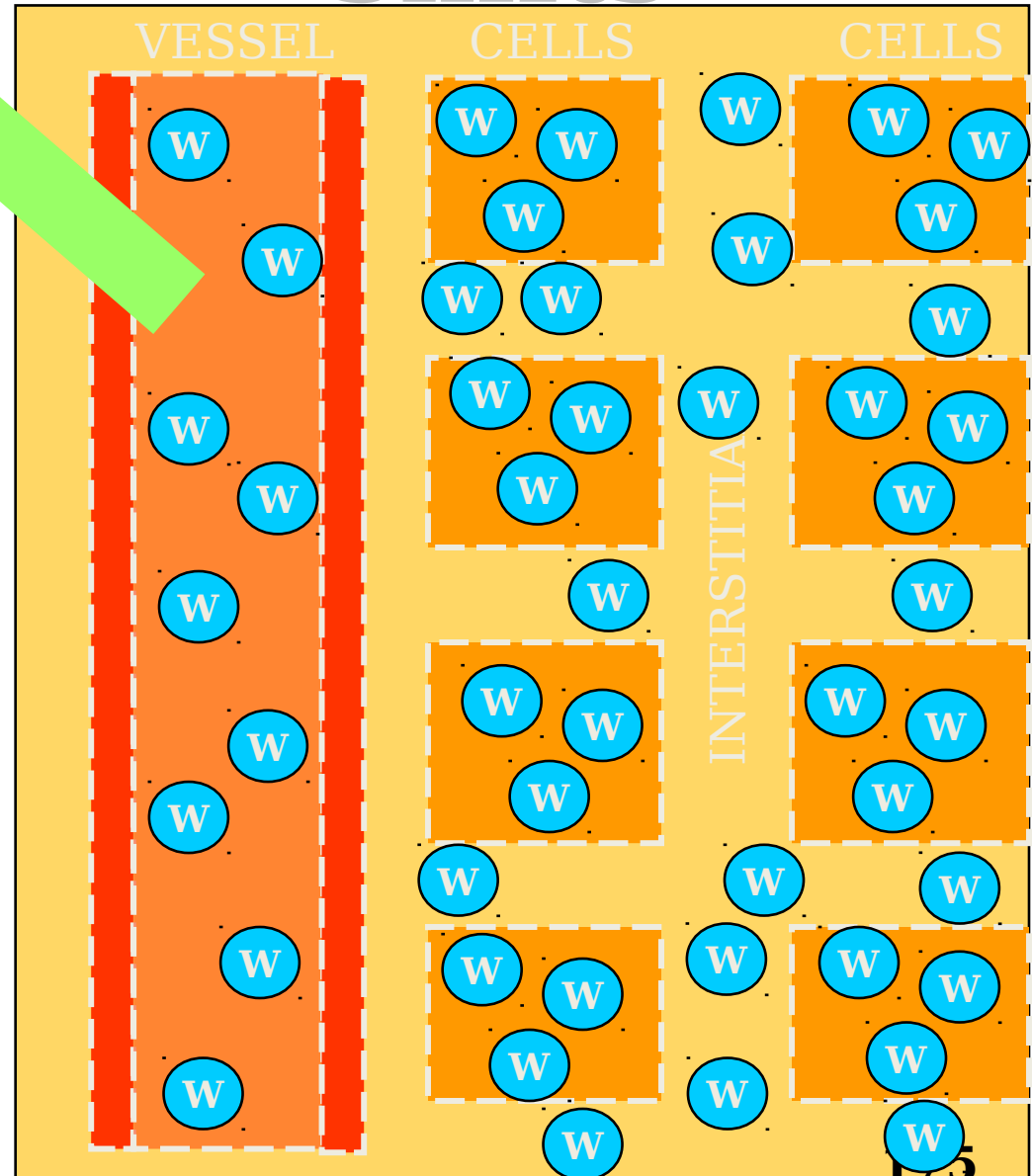
Choice of Resuscitation Fluid

- 500ml of 6% hetastarch (trade name Hextend[®], weighs 1.3lbs) and will yield an expansion of the intravascular volume of 600-800ml.
- **This intravascular expansion is still present 8 hours later - may be critical if evacuation is delayed.**
- Hextend[®]
 - Less weight to carry for equal effect
 - Stays where it is supposed to be longer and does the casualty more good
 - Less likely to cause undesirable side effects

Crystalloid Fluid Shifts

W Water Molecules
LR LR Molecules

- Small sodium, chloride, potassium, etc. from crystalloids leak through vessel membranes
- In 1 hour, only 25% of crystalloid fluid is still in the vascular space
- For a 1000ml bag, that's only 250ml still in the vessels
- The rest of the fluid diffuses to the



Hextend® Fluid Shifts

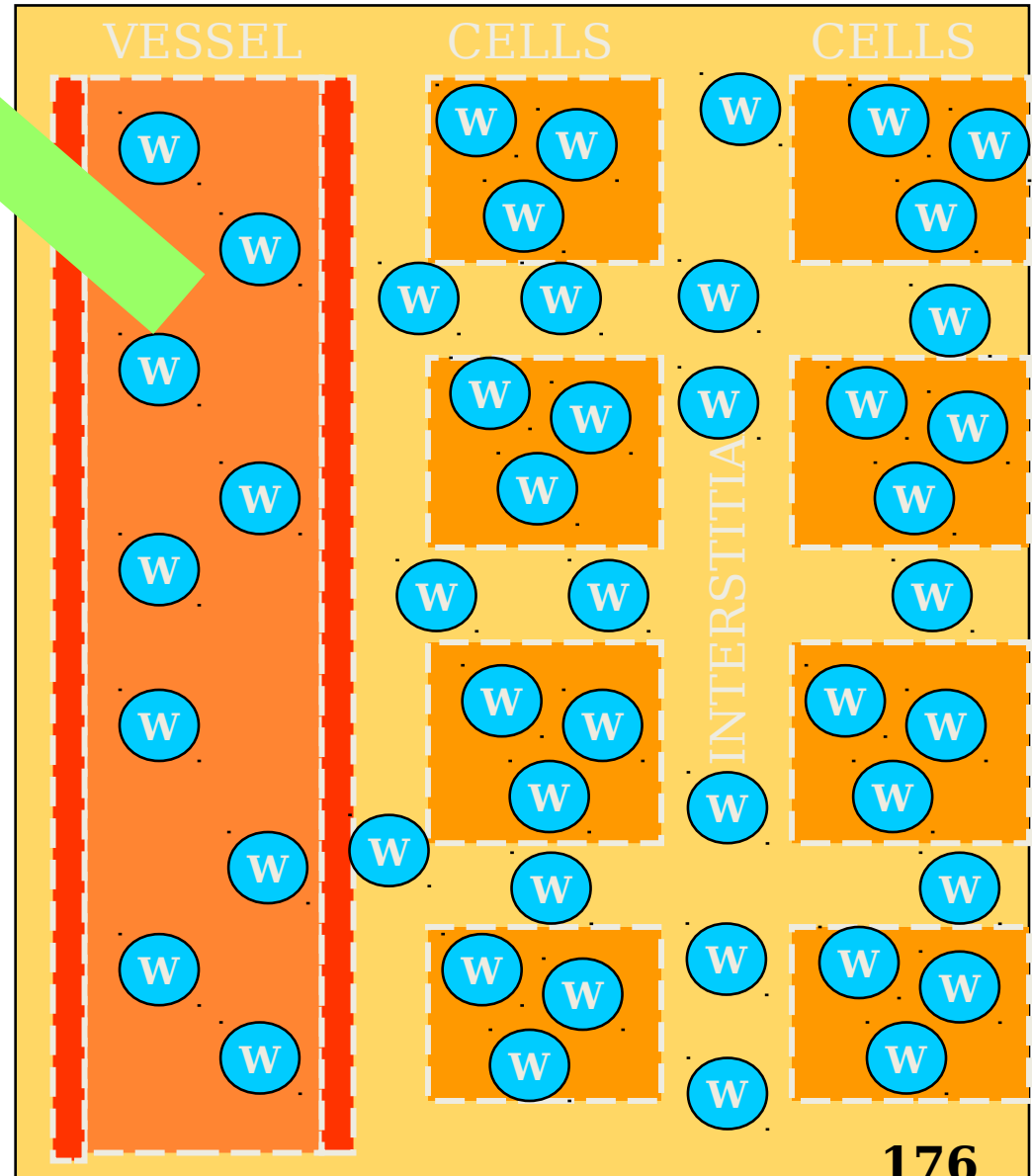


Water Molecules



Hextend Molecules

- Large Hextend particles remain in the vessels for 8 hours
- Osmotic pressure pulls additional water from the interstitial and intracellular spaces into the vessels
- The expansion resulting from 500ml of Hextend is



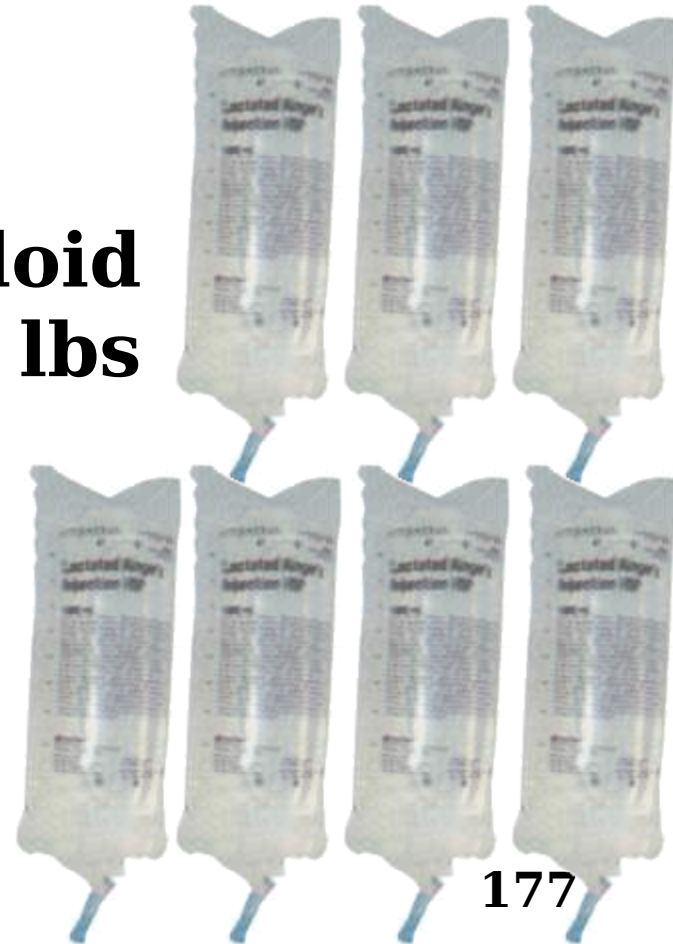
Compare Fluids

- Max dose of Hextend is 1,000ml (1,600ml of volume expansion effect)
- To get the same effect from crystalloid, it requires 7,000ml PER CASUALTY!
- Which would you rather carry?
- Hextend is preferred as a weight saving advantage for combat trauma
- For hemorrhagic shock, IIR is 2nd choice

Hextend
2.6 lbs



Crystalloid
14.4 lbs





Fluid Resuscitation Strategy

- If signs of shock are present, ***CONTROL THE BLEEDING FIRST***, if at all possible.
 - Hemorrhage control takes precedence over infusion of fluids.
- Hextend, 500ml bolus initially
- If mental status and radial pulse improve, maintain saline lock – do not give additional Hextend.



Fluid Resuscitation Strategy

- After 30 minutes, reassess state of consciousness and radial pulse. If not improved, give an additional 500ml of Hextend.®
- Continued efforts to resuscitate must be weighed against logistical and tactical considerations and the risks of incurring further casualties.
- Hextend has no significant effects on coagulation and immune function at the recommended maximum volume of 1000 ml (for adults)



TBI Fluid Resuscitation

If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse :

- Resuscitate with sufficient Hextend® to maintain a palpable radial pulse.
- Shock increases mortality in casualties with head injuries.
- Must give adequate IV fluids to restore adequate blood flow to brain.



Questions?





Tactical Field Care Guidelines

8. Prevention of hypothermia

- a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible.**
- b. Replace wet clothing with dry if possible. Get the casualty onto an insulated surface as soon as possible.**
- c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).**



Tactical Field Care Guidelines

8. Prevention of hypothermia (cont)

- d. If an HRS is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used.**
- e. If the items mentioned above are not available, use dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.**
- f. Warm fluids are preferred if IV fluids are required.**



THE OLD HPMK





6 - Cell
"Ready-Heat"
Blanket

4- Cell
"Ready-Heat"
Blanket



Apply Ready Heat blanket to torso OVER shirt.



Repea t

- Do **NOT** place the ready-Heat Blanket directly on the skin
- Multiple reports of skin burns from this being done
- Keep cammie top or T-shirt on
- Place Ready-Heat over the fabric



• **NEW HPMK**





Hypothermia Prevention

- **Key Point: Even a small decrease in body temperature can interfere with blood clotting and increase the risk of bleeding to death.**
- Casualties in shock are unable to generate body heat effectively.
- Wet clothes and helicopter evacuations increase body heat loss.
- Remove wet clothes and cover casualty with hypothermia prevention gear.
- **Hypothermia is much easier to prevent than to treat!**



Tactical Field Care Guidelines

9. Penetrating Eye Trauma

If a penetrating eye injury is noted or suspected:

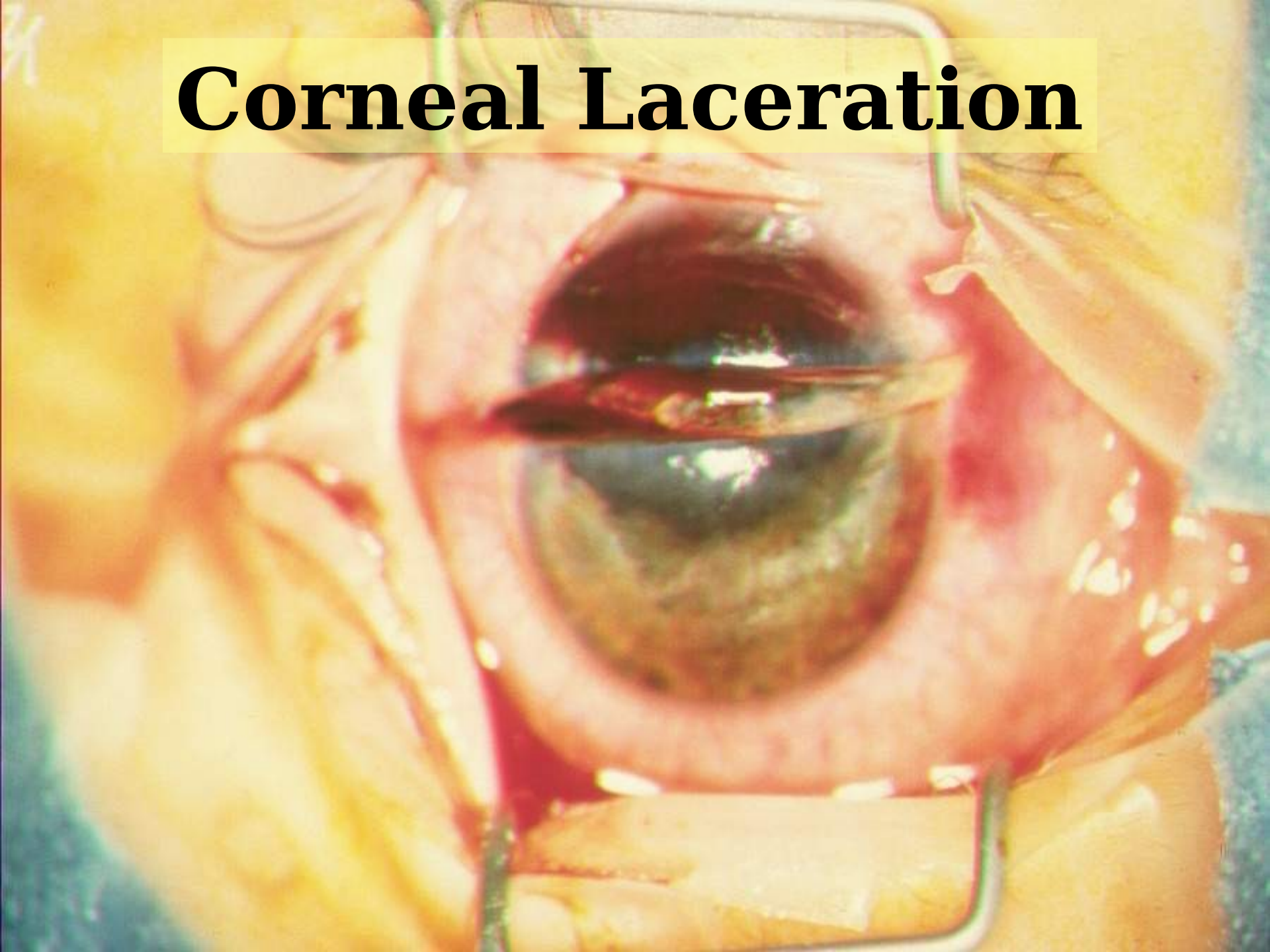
- a) Perform a rapid field test of visual acuity.**
- b) Cover the eye with a rigid eye shield (NOT a pressure patch.)**
- c) Ensure that the 400 mg moxifloxacin tablet in the combat pill pack is taken if possible, or that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.**



Checking Vision in the Field

- Don't worry about charts
- Determine which of the following the casualty can see (start with "Read print" and work down the list if not able to do that.)
 - Read print
 - Count fingers
 - Hand motion
 - Light perception

Corneal Laceration





Small Penetrating Eye Injury

Protect the eye with a SHIELD, not





Eye Protection



- Use your tactical eyewear to cover the injured eye if you don't have a shield.
- Using tactical eyewear in the field will generally prevent



Both injuries can result in eye infections
that cause permanent blindness – GIVE
ANTIBIOTICS!



Tactical Field Care Guidelines

10. Monitoring

Pulse oximetry should be available as an adjunct to clinical monitoring. Readings may be misleading in the settings of shock or marked hypothermia.



Pulse Oximetry Monitoring

- Pulse oximetry – tells you how much oxygen is present in the blood
- Shows the heart rate and the percent of oxygenated blood (“O2 sat”) in the numbers displayed
- 98% or higher is normal O2 sat at sea level.
- 86% is normal at 12,000 feet – lower oxygen pressure altitude





Pulse Oximetry Monitoring

Consider using a pulse ox for these types of casualties:

- TBI – good O₂ sat very important for a good outcome
- Unconscious
- Penetrating chest trauma
- Chest contusion
- Severe blast trauma





Pulse Oximetry Monitoring

Oxygen saturation values may be inaccurate in the presence of:

- Hypothermia
- Shock
- Carbon monoxide poisoning
- Very high ambient light levels





Tactical Field Care Guidelines

11. Inspect and dress known wounds.

12. Check for additional wounds.





Tactical Field Care Guidelines

13. Provide analgesia as necessary.

a. Able to fight:

These medications should be carried by the combatant and self-administered as soon as possible after the wound is sustained.

- Mobic, 15 mg PO once a day
- Tylenol, 650-mg bilayer caplet, 2 caplets
PO every 8 hours



Tactical Field Care Guidelines

13. Provide analgesia as necessary.

b. Unable to fight

Note: Have naloxone readily available whenever administering opiates.

- Does not otherwise require IV/IO access
- Oral transmucosal fentanyl citrate (OTFC), 800ug transbuccally
 - Recommend taping lozenge-on-a-stick to casualty's finger as an added safety measure
- Reassess in 15 minutes
- Add second lozenge, in other cheek, as necessary to control severe pain.
- Monitor for respiratory depression.



Tactical Field Care Guidelines

13. Provide analgesia as necessary.

b. Unable to fight

- IV or IO access obtained:**
- Morphine sulfate, 5 mg IV/IO**
- Reassess in 10 minutes.**
- Repeat dose every 10 minutes as
necessary to control severe
pain.**

- Monitor for respiratory depression**

**c. Promethazine, 25 mg IV/IO/IM every 6
hours**

**as needed for nausea or for synergistic
analgesic effect**



Pain Control

Pain Control When Able to fight:

- Mobic and Tylenol are the medications of choice
- Both should be packaged in a COMBAT PILL PACK and taken by the casualty as soon as feasible after wounding.
- **Mobic and Tylenol DO NOT cause a decrease in state of consciousness and DO NOT interfere with blood clotting.**
- Medications like aspirin, Motrin, and Toradol DO interfere with blood clotting and should not be used by combat troops in theater.



Pain Control - Fentanyl Lozenge

Pain Control - Unable to E

- If casualty does not otherwise require IV/IO access
 - Oral transmucosal fentanyl citrate, 800 μ g (between cheek and gum)
 - **VERY FAST-ACTING; WORKS ALMOST AS FAST AS IV MORPHINE**
 - **VERY POTENT PAIN RELIEF**

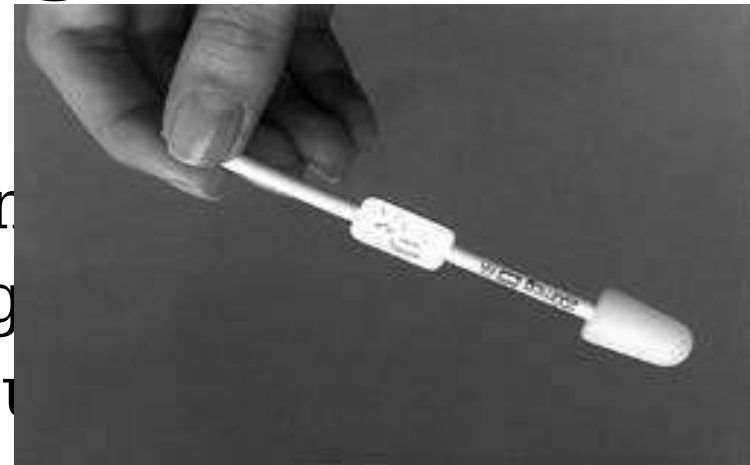




Pain Control - Fentanyl Lozenge

Dosing and Precautions

- Tape fentanyl “lozenge on a stick” to casualty’s finger as an added safety measure
- Re-assess in 15 minutes
- Add second lozenge in other cheek if needed
- Respiratory depression very unlikely – especially if only 1 lozenge is used
- Monitor for respiratory depression and have naloxone (Narcan) (0.4 - 2.0mg IV) ready to treat





Pain Control - Fentanyl Lozenge

Safety Note:

- There is an FDA Safety Warning regarding the use of fentanyl lozenges in individuals who are not narcotic-tolerant.
- Multiple studies have demonstrated safety when used at the recommended dosing levels,
BUT NOTE:
 - **DON'T USE TWO WHEN ONE WILL DO!**





Pain Control

Pain Control - Unable to Fight

- If Casualty requires IV/IO access
 - Morphine 5 mg IV/IO
 - Repeat every 10 minutes as needed
 - **IV preferred to IM because of much more rapid onset of effect (1-2 minutes vice 45 minutes)**
 - Phenergan® 25mg IV/IM as needed for N&V
- Monitor for respiratory depression and have naloxone available



Morphine Carpuject for Intravenous Use





Morphine:

IM Administration

- **IV/IO morphine given by medic/corpsman/PJ is preferred to IM - pain relief is obtained in 1-2 min compared to 45 minutes IM**
- Intramuscular injection is an alternative if no medic/corpsman/PJ is available to give it IV.
- Initial dose is 10 mg (one autoinjector)
- Wait 45 to 60 minutes before additional dose
- Attach auto injectors or put "M" on forehead to note each dose given



Morphine Injector for IM (intramuscular) Injection





IM Morphine Injection Target Areas

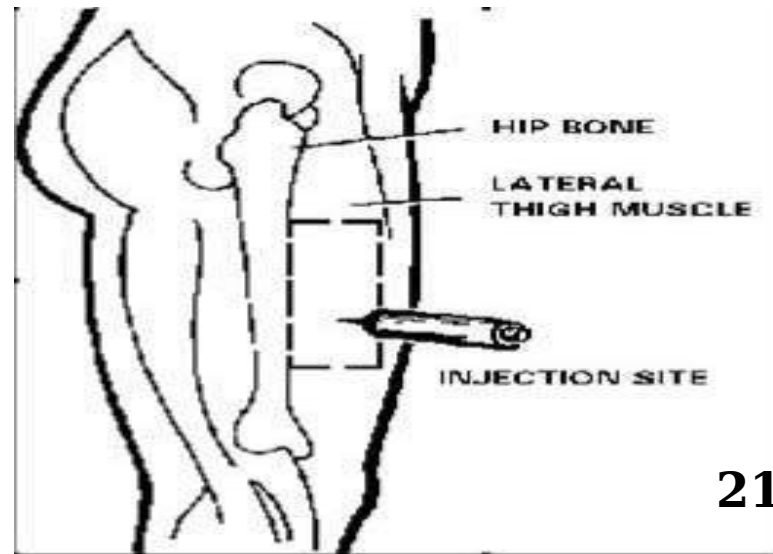
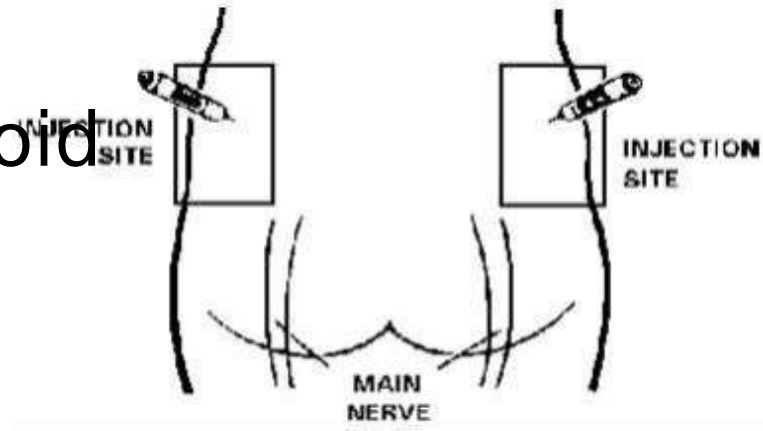
Triceps





IM Morphine Injection Target Areas

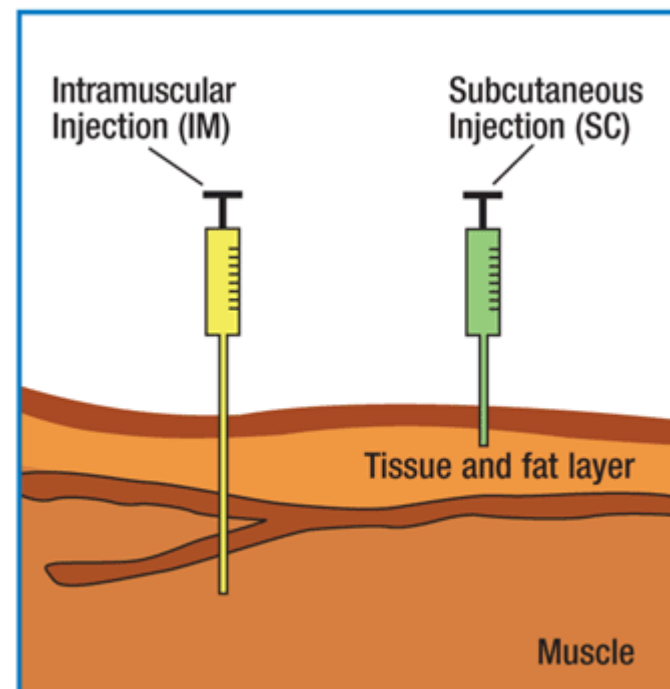
- Buttocks – Upper/outer quadrant to avoid nerve damage
- Anterior thigh





IM Morphine Injection Technique Tips

- Expose injection site
- Clean injection site if feasible
- Squeeze muscle with other hand
- Auto-inject
 - Hold in place for 10 seconds
- Go all the way into the muscle as shown





Warning: Morphine and Fentanyl **Contraindications**

- Hypovolemic shock
- Respiratory distress
- Unconsciousness
- Severe head injury
- **DO NOT give narcotics to casualties with these contraindications.**





Pain Medications - Key Points!

- **Aspirin, Motrin, Toradol, and other nonsteroidal anti-inflammatory medicines (NSAIDs) other than Mobic should be avoided while in a combat zone because they interfere with blood clotting.**
- Aspirin, Motrin, and similar drugs inhibit platelet function for approximately 7-10 days after the last dose.
- **You definitely want to have your platelets working normally if you get shot.**
- Mobic and Tylenol DO NOT interfere with platelet function – this is the primary feature that makes them the non-narcotic pain medications of choice.



Tactical Field Care Guidelines

14. Splint fractures and recheck pulse.





Fractures: Open or Closed

- **Open Fracture** - associated with an overlying skin wound
- **Closed Fracture** - no overlying skin wound

Open fracture



Closed fracture





Clues to a Closed Fracture

- **Trauma with significant pain AND**
- **Marked swelling**
- **Audible or perceived snap**
- **Different length or shape of limb**
- **Loss of pulse or sensation distally**
- **Crepitus (“crunchy” sound)**



Splinting Objectives

- **Prevent further injury**
- **Protect blood vessels and nerves**
 - **Check pulse before and after splinting**
- **Make casualty more comfortable**





Principles of Splinting

- **Check for other injuries**
- **Use rigid or bulky materials**
- **Try to pad or wrap if using rigid splint**
- **Secure splint with ace wrap, cravats, belts, duct tape**
- **Try to splint before moving casualty**



Principles of Splinting

- **Minimize manipulation of extremity before splinting**
- **Incorporate joint above and below**
- **Arm fractures can be splinted to shirt using sleeve**
- **Consider traction splinting for mid-shaft femur fracture**
- **Check distal pulse and skin color before and after splinting**





Things to Avoid in Splinting

- **Manipulating the fracture too much and damaging blood vessels or nerves**
- **Wrapping the splint too tight and cutting off circulation below**





Commercial Splints





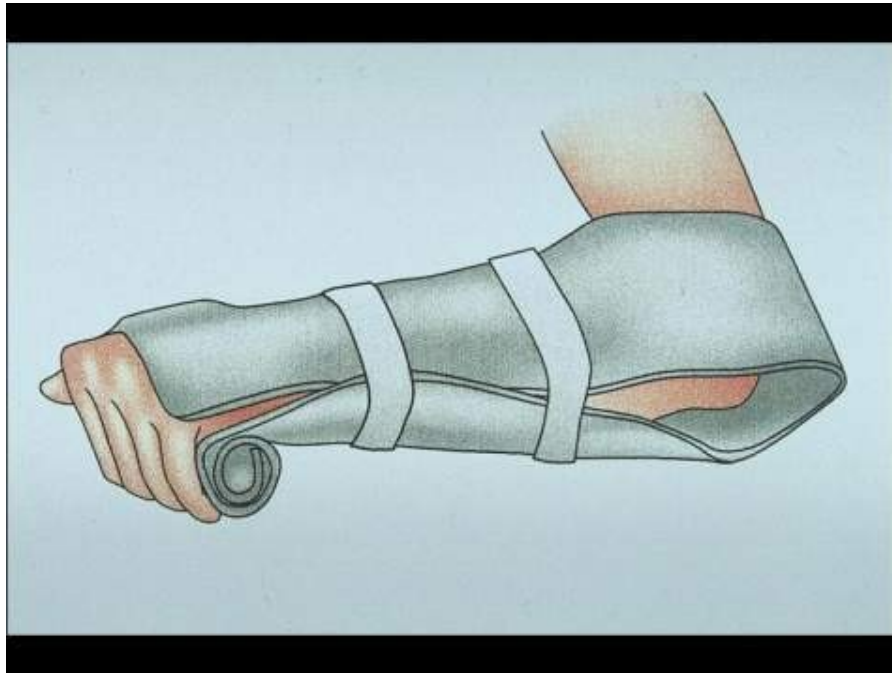
Field-Expedient Splint Materials

- **Shirt sleeves/safety pins**
- **Weapons**
- **Boards**
- **Boxes**
- **Tree limbs**
- **ThermaRest pad**





Don't Forget!



**Pulse, motor and sensory checks
before and after splinting**



Splinting Practical





Tactical Field Care Guidelines

15. Antibiotics: recommended for all open combat wounds:

a. If able to take PO meds:

- Moxifloxacin, 400 mg PO one a day**

b. If unable to take PO (shock, unconsciousness):

- Cefotetan, 2 g IV (slow push over 3-5 minutes)
or IM, every 12 hours**

or

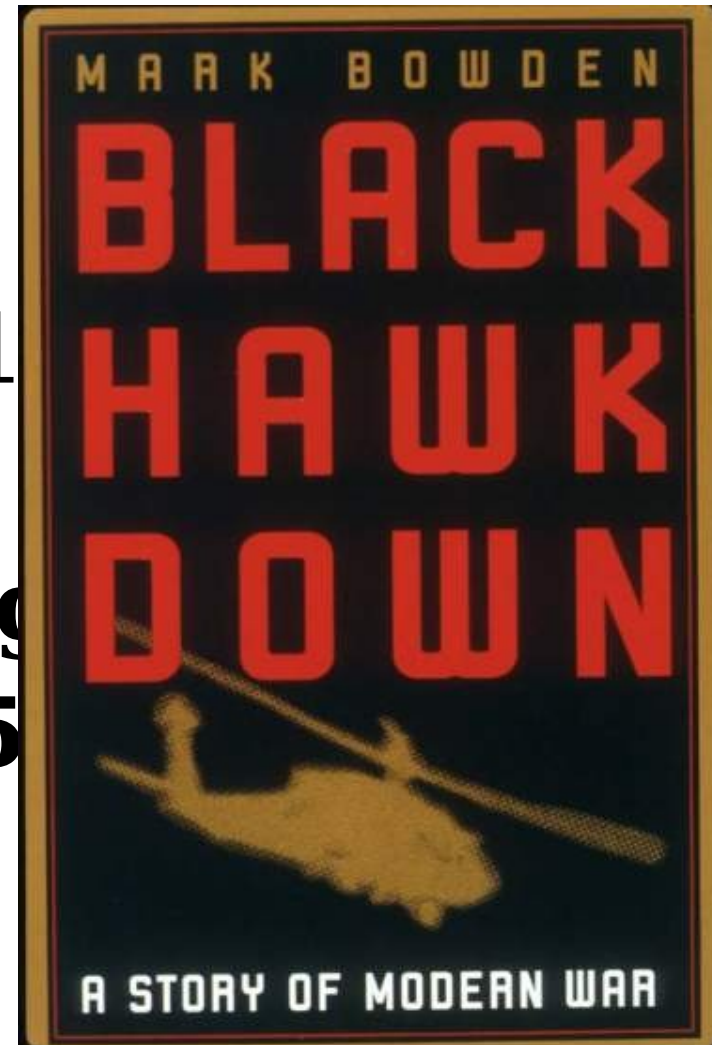
- Ertapenem, 1 g IV/IM once a day**



Outcomes: Without Battlefield Antibiotics

- **Mogadishu 1993**
- **Casualties: 58**
- **Wound Infections: 1**
- **Infection rate: 28%**
- **Time from wounding to Level II care - 15**

*Mabry et al
J Trauma 2000*





Outcomes: With Battlefield Antibiotics

Tarpey - AMEDD J 2005:

- 32 casualties with open wounds**
- All received battlefield antibiotics**
- None developed wound infections**
- Used TCCC recommendations modified by availability:**
 - Levofloxacin for an oral antibiotic**
 - IV cefazolin for extremity injuries**
 - IV ceftriaxone for abdominal injuries.**



Outcomes: With Battlefield Antibiotics

- **MSG Ted Westmoreland**
- **Special Operations Medical Association presentation 2004**
- **Multiple casualty scenario involving 19 Ranger and Special Forces WIA as well as 30 Iraqi WIA**
- **11-hour delay to hospital care**
- **Battlefield antibiotics given**
- **No wound infections developed in this group.**



Battlefield Antibiotics



Recommended for all open wounds on the battlefield!



Battlefield Antibiotics

If casualty can take PO meds

- **Moxifloxacin 400 mg**, one tablet daily
 - Broad spectrum – kills most bacteria
 - Few side effects
 - Take as soon as possible after life-threatening conditions have been addressed
 - Delays in antibiotic administration increase the risk of wound infections



Combat Pill Pack

In the event of open combat wound
swallow all four pills with water.

Mobic 15mg

Tylenol ER 650mg, 2 caplets

Moxifloxacin 400mg



Pain Management and Infection Control
For Combat Casualties

"Just Got Easier To Swallow"



Battlefield Antibiotics

- Casualties who cannot take PO meds
 - Ertapenem 1 gm IV/IM once a day
 - IM should be diluted with lidocaine (1 gm vial ertapenem with 3.2cc lidocaine without epinephrine)
 - IV requires a 30-minute infusion time
- NOTE: Cefotetan is also a good alternative, but has been more difficult to obtain through supply channels





Medication

Allergies

- **Screen your units for drug allergies!**
- Patients with allergies to aspirin or other non-steroidal anti-inflammatory drugs should not use Mobic.
- Allergic reactions to Tylenol are uncommon.
- Patients with allergies to flouroquinolones, penicillins, or cephalosporins may need alternate antibiotics which should be selected by unit medical personnel during the pre-deployment phase. **Check with your unit physician if unsure.**



Tactical Field Care Guidelines

16. Burns

- a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.
- b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines. (see third slide)





Degrees of Burns

Superficial burn
“First Degree”



Partial thickness burn
“Second degree”





Degrees of Burns

Full-thickness burn
“Third degree”

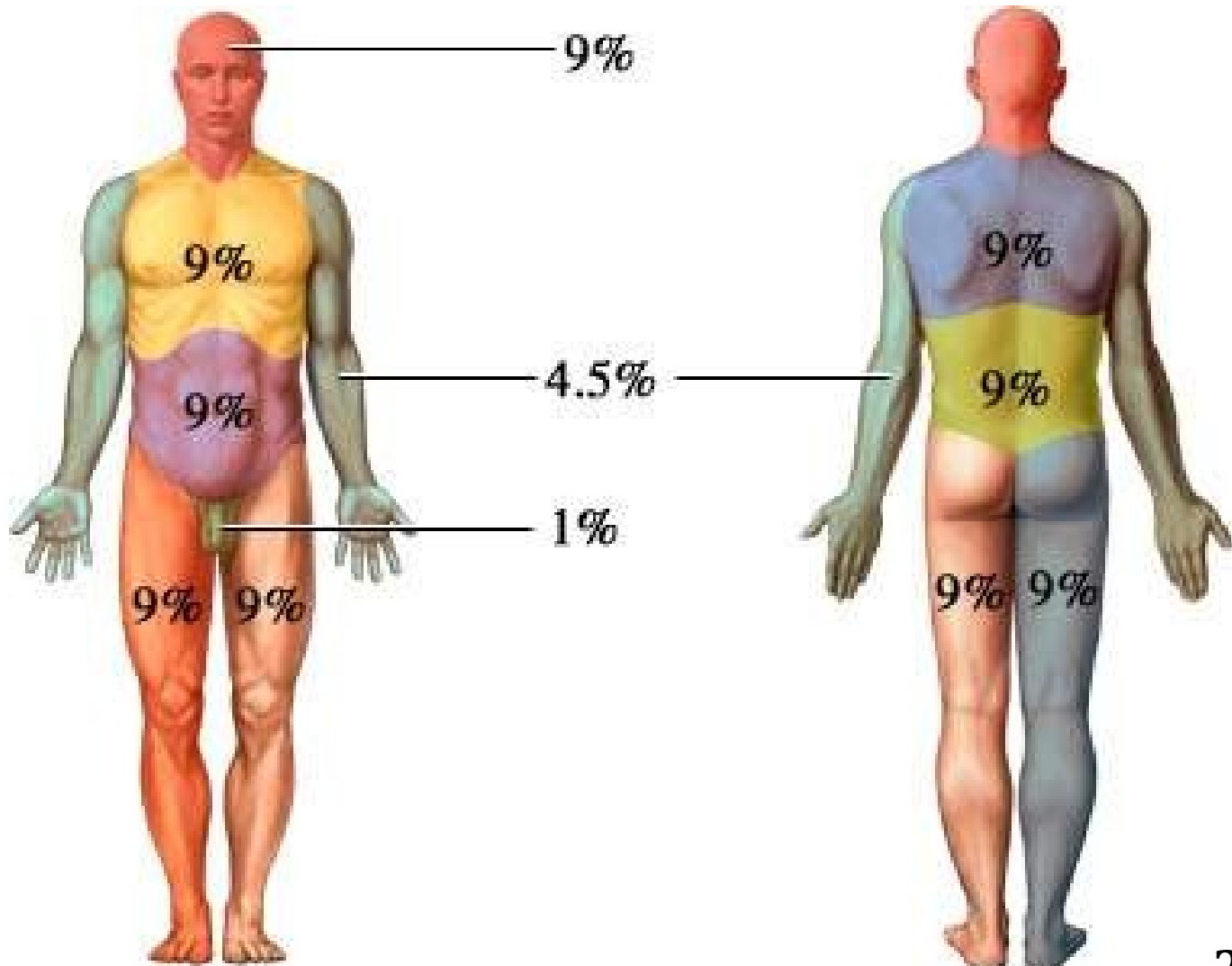


Deep(subdermal) burn
“Fourth-degree”





Rule of Nines for Calculating Burn Area





Tactical Field Care Guidelines

16. Burns (cont)

c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the HRS or the Blizzard Survival Blanket in the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.





Tactical Field Care Guidelines

16. Burns (cont)

d. Fluid resuscitation (USAISR Rule of Ten)

- If **burns are greater than 20%** of Total Body Surface Area, fluid resuscitation should be initiated as soon as IV/IO access is established. **Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed.**



Tactical Field Care Guidelines

16. Burns (cont)

- **Initial IV/IO fluid rate is calculated as %TBSA x 10cc/hr for adults weighing 40-80 kg.**
- **For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr.**
- **If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section 7.**



Tactical Field Care Guidelines

16. Burns (cont)

- e. Analgesia in accordance with TCCC Guidelines in Section 13 may be administered to treat burn pain.**
- f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per TCCC guidelines in Section 15 if indicated to prevent infection in penetrating wounds.**



Tactical Field Care Guidelines

16. Burns (cont)

g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

These casualties are “Trauma casualties with burns” - not the other way around

US Army ISR Burn Center





Tactical Field Care Guidelines

17. Communicate with the casualty if possible.

- Encourage; reassure**
- Explain care**





Tactical Field Care Guidelines

18. Cardiopulmonary resuscitation (CPR)

Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations,

and no other signs of life will not be successful and should not be attempted. **However, casualties with torso trauma or polytrauma who have no pulse or respirations during TFC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax prior to discontinuation of care. The procedure is the same as described in section 3 above.**



CPR



NO battlefield CPR



CPR in Civilian Trauma

- 138 trauma patients with prehospital cardiac arrest and in whom resuscitation was attempted.
- No survivors
- Authors recommended that trauma patients in cardiopulmonary arrest not be transported emergently to a trauma center even in a civilian setting due to large economic cost of treatment without a significant chance for survival.

Rosemurgy et al. J Trauma 1993



The Cost of Attempting CPR on the Battlefield

- **CPR performers may get killed**
- **Mission gets delayed**
- **Casualty stays dead**



CPR on the Battlefield (Ranger Airfield Operation in Grenada)

- Airfield seizure operation
- Ranger shot in the head by sniper
- No pulse or respirations
- CPR attempts unsuccessful
- Operation delayed while CPR performed
- Ranger PA finally intervened: “Stop CPR and move out!”



CPR in Tactical Setting

Only in the case of cardiac arrests from:

- Hypothermia
- Near-drowning
- Electrocution
- Other non-traumatic causes

should CPR be considered prior to the Tactical Evacuation Care phase.



Traumatic Cardiac Arrest in TCCC

- Mounted IED attack in March 2011
- Casualty unconscious from closed head trauma
- Lost vital signs prehospital
- CPR on arrival at hospital
- **Bilateral needle decompression** done in ER
- Rush of air from left-sided tension pneumothorax
- Return of vital signs – life saved
- This procedure is routinely done by Emergency Medicine physicians and Trauma Surgeons for trauma victims who lose their pulse and heart rate in the hospital Emergency Department.



Questions?





Tactical Field Care Guidelines

19. Documentation of Care:

Document clinical assessments, treatments rendered, and changes in the casualty's status on a TCCC Casualty Card. Forward this information with the casualty to the next level of care.



TCCC Casualty Card

- Designed by combat medics
- Used in combat since 2002
- Replaces DD Form 1380
- Only essential information
- Can be used by hospital to document injuries sustained and field treatments rendered
- Heavy-duty waterproof or laminated paper



TCCC Casualty Card

DA Form 7656

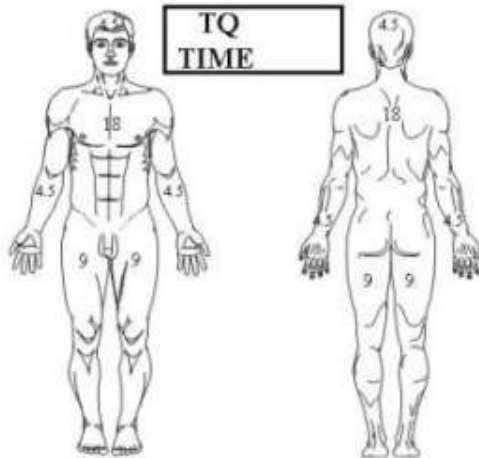
Name/ID: _____

DTG: _____ ALLERGIES: _____

Friendly

Unknown

NBC



GSW BLAST MVA Other _____

TIME				
AVPU				
PULSE				
RESP				
BP				

DD FORM XXXX (Tactical Combat Casualty Care Card)

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDx
IV IO

FLUIDS: NS / LR 500 1000 1500
Hextend 500 1000

Other: _____

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

Medic's Name _____

Thanks to the 75th Ranger Regiment



TCCC Casualty Card

- This card is based on the principles of TCCC.
- It addresses the initial lifesaving care provided at the point of wounding.
- Filled out by *whoever* is caring for the casualty.
- Its format is simple with a circle or “X” in the appropriate block.



Instructions

- Follow the instructions on the following slides for how to use this form.
- This casualty card should be in each Individual First Aid Kit.
- Use an indelible marker to fill it out.
- Attach it to the casualty's belt loop, or place it in their upper left sleeve, or the left trouser cargo pocket.
- Include as much information as you can.



TCCC Card Front

- Individual's name and allergies should already be filled in.
- This should be done when placed in IFAK.

Name/Unit _____

DTG: _____ **ALLERGIES:** _____

Friendly Unknown NBC

TQ TIME

4.5 18 4.5 9 1 9 4.5 18 4.5 9 9

GSW BLAST MVA Other _____

TIME				
AVPU				
PULSE				
RESP				
BP				

DA FORM 7656, XXX ####



TCCC Card Front

- Add date-time group
- Cause of injury, and whether friendly, unknown, or NBC.

Name/Unit _____				
DTG: _____		ALLERGIES: _____		
Friendly Unknown NBC				
<div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;"><p>4.5 18 4.5 9 1 9</p></div><div style="border: 1px solid black; padding: 5px; text-align: center;">TQ TIME</div><div style="text-align: center;"><p>4.5 18 4.5 9 9</p></div></div>				
GSW BLAST MVA Other _____				
TIME				
AVPU				
PULSE				
RESP				
BP				
DA FORM 7656, XXX ####				



TCCC Card Front

- Mark an “X” at the site of the injury/ies on body picture
- Note burn percentages on figure

Name/Unit _____

DTG: _____ **ALLERGIES:** _____

Friendly Unknown NBC

TQ TIME

GSW BLAST MVA Other _____

TIME				
AVPU				
PULSE				
RESP				
BP				

DA FORM 7656, XXX ###



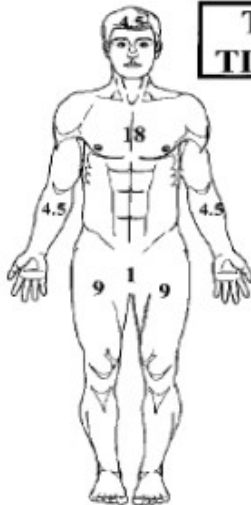
TCCC Card Front

- Record casualty's level of consciousness and vital signs with time.

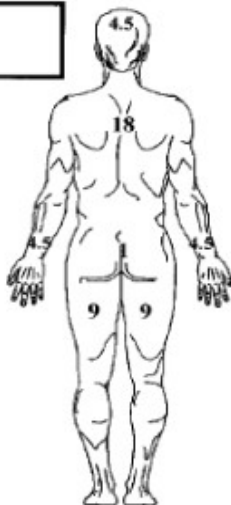
Name/Unit _____

DTG: _____ **ALLERGIES:** _____

Friendly Unknown NBC



**TQ
TIME**



GSW BLAST MVA Other _____

TIME				
AVPU				
PULSE				
RESP				
BP				

DA FORM 7656, XXX ###



TCCC Card Back

- Record airway interventions.

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



TCCC Card Back

- Record breathing interventions

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



TCCC Card Back

- Record bleeding control measures.
- Don't forget tourniquet time on front of card.

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



TCCC Card Back

- Record route of fluid, type, and amount given.

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



TCCC Card Back

- Record any drugs given: pain meds, antibiotics, or other.

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



TCCC Card Back

- Record any pertinent notes.

A: Intact Adjunct Cric Intubated	
B: Chest Seal NeedleD ChestTube	
C: TQ Hemostatic Packed PressureDrsg	
<hr/>	
FLUIDS: IV IO	
NS / LR 500 1000 1500	
Hextend 500 1000	
Other:	
<hr/>	
DRUGS (Type / Dose / Route):	
PAIN	
ABX	
OTHER	
<hr/>	
<hr/>	
<hr/>	
<hr/>	
<hr/>	
<hr/>	
<hr/>	
<hr/>	
First Responder's Name _____	



TCCC Card Back

- Sign card.
- Does not have to be a medic or corpsman to sign

A: Intact Adjunct Cric Intubated

B: Chest Seal NeedleD ChestTube

C: TQ Hemostatic Packed PressureDrsg

FLUIDS: IV IO

NS / LR 500 1000 1500

Hextend 500 1000

Other:

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

First Responder's Name _____



Documentation

- Record each specific intervention in each category.
- If you are not sure what to do, the card will prompt you where to go next.
- Simply circle the intervention you performed.
- Explain any action you want clarified in the remarks area.



Documentation

- The card does not imply that every casualty needs all of these interventions.
- You may not be able to perform all of the interventions that the casualty needs.
- The next person caring for the casualty can add to the interventions performed.
- This card can be filled out in less than two minutes.
- It is important that we document the care given to the casualty.



TCCC Card

Abbreviations

- DTG = Date-Time Group (e.g. - 160010Oct2009)
- NBC = Nuclear, Biological, Chemical
- TQ = Tourniquet
- GSW = Gunshot Wound
- MVA = Motor Vehicle Accident
- AVPU = Alert, Verbal stimulus, Painful stimulus, Unresponsive
- Cric = Cricothyroidotomy
- NeedleD = Needle decompression
- IV = Intravenous
- IO = Intraosseous
- NS = Normal Saline
- LR = Lactated Ringers
- ABX = Antibiotics

Questions ?





Further Elements of Tactical Field Care

- Reassess regularly.
- Prepare for transport.
- Minimize removal of uniform and protective gear, but get the job done.
- Replace body armor after care, or at least keep it with the casualty. He or she may need it again if there is additional contact.



Further Elements of Tactical Field Care

Casualty movement in TFC may be better accomplished using litters





Litter Carry Video

- Secure the casualty on the litter
- Bring his weapon





Summary of Key Points

- Still in hazardous environment
- Limited medical resources
- Hemorrhage control
- Airway management
- Breathing
- Transition from tourniquet to another form of hemorrhage control when appropriate
- Hypotensive resuscitation with Hextend for hemorrhagic shock
- Hypothermia prevention



Summary of Key Points

- Shield and antibiotics for penetrating eye injuries
- Pain control
- Antibiotics
- Reassure casualties
- No CPR
- Documentation of care



Questions?



Wear your body armor!



Management of Wounded Hostile Combatants





Objective

- DESCRIBE the considerations in rendering trauma care to wounded hostile combatants.



Care for Wounded Hostile Combatants

- No medical care during Care Under Fire
- Though wounded, enemy personnel may still act as hostile combatants
 - May employ any weapons or detonate any ordnance they are carrying
- **Enemy casualties are hostile combatants until they:**
 - **Indicate surrender**
 - **Drop all weapons**
 - **Are proven to no longer pose a threat**



Care for Wounded Hostile Combatants

- **Combat medical personnel should not attempt to provide medical care until sure that wounded hostile combatant has been rendered safe by other members of the unit.**
- Restrain with flex cuffs or other devices if not already done.
- Search for weapons and/or ordnance.
- Silence to prevent communication with other hostile combatants.

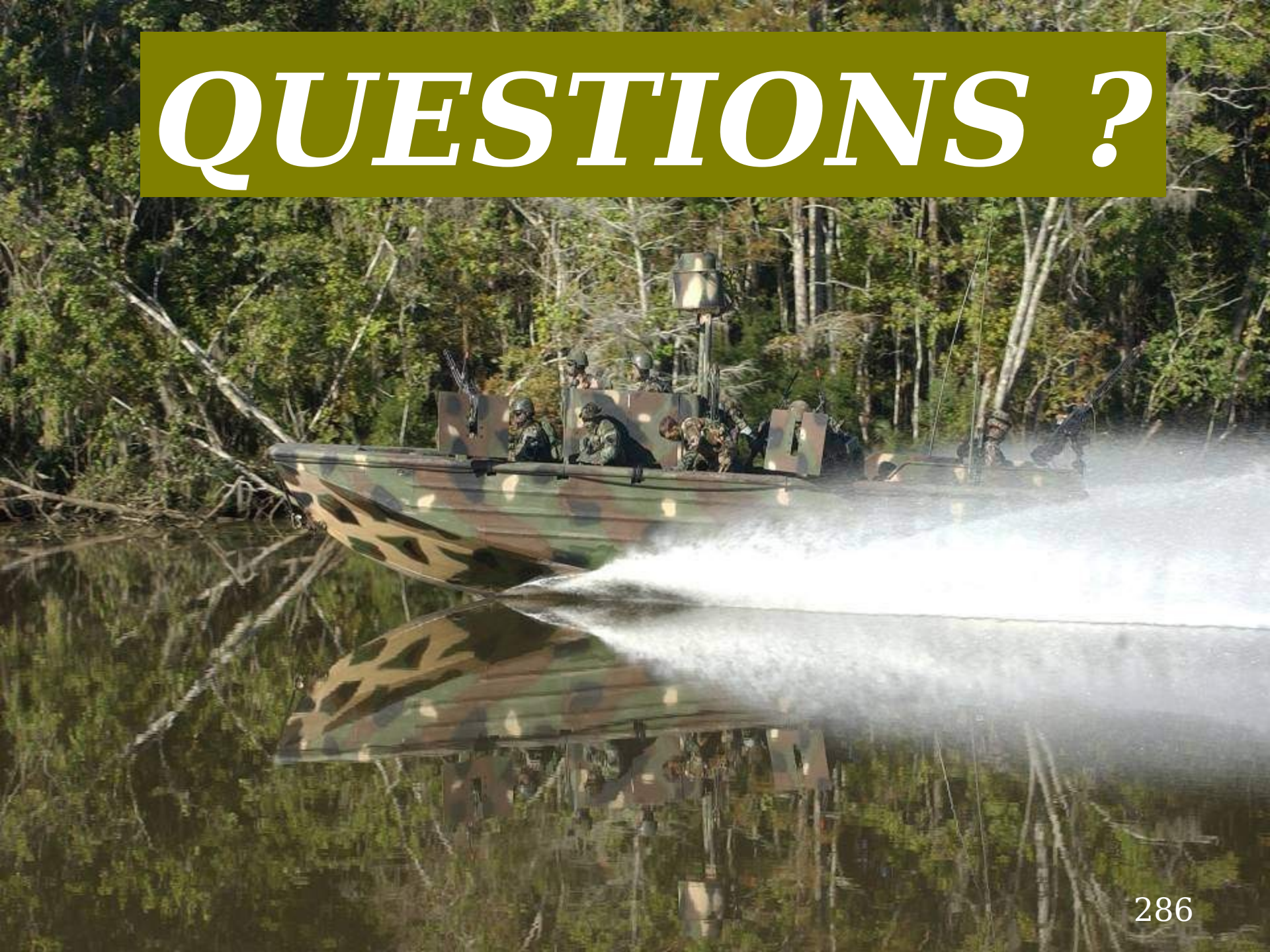


Care for Wounded Hostile Combatants

- Segregate from other captured hostile combatants.
- Safeguard from further injury.
- **Care as per TFC guidelines for U.S. forces after above steps are accomplished.**
- Speed to the rear as medic and tactically feasible



QUESTIONS ?





Convoy IED Scenario

- Recap from Care Under Fire
- Your last medical decision during Care Under Fire:
 - Placed tourniquet on left stump
- You moved the casualty behind cover and returned fire.
- You provided an update to your mission commander



Convoy IED Scenario

Assumptions in discussing TFC in this scenario:

- Effective hostile fire has been suppressed.
- Team Leader has directed that the unit will move.
- Pre-designated HLZ for helicopter evacuation is 15 minutes away.
- Flying time to hospital is 30 minutes.
- Ground evacuation time is 3 hours.
- Enemy threat to helicopter at HLZ estimated to be minimal.



Convoy IED Scenario

Next decision (Command Element)?

- How to evacuate casualty?
 - Helicopter
 - Longer time delay for ground evacuation
 - Enemy threat at HLZ acceptable



Convoy IED Scenario

Next decision (Command Element)?

- Load first and treat enroute to HLZ or treat first and load after?
 - Load and Go
 - Why?
 - Can continue treatment enroute
 - Avoid potential second attack at ambush site



Convoy IED Scenario

Casualty is still conscious and has no neck or back pain.

Next decision?

- Do you need spinal immobilization?
- No
 - Not needed unless casualty has neck or back pain
 - Why?
 - Low expectation of spinal fracture in the absence of neck or back pain in a conscious casualty
 - Speed is critical
 - NOTE: Casualties who are unconscious from primary blast trauma should have spinal immobilization if feasible.



Convoy IED Scenario

Ten minutes later, you and the casualty are in a vehicle enroute to HLZ.

Next action?

- Reassess casualty
 - Casualty is now unconscious
 - No bleeding from first tourniquet site
 - Other stump noted to have severe bleeding



Convoy IED Scenario

- Next action?
 - Place tourniquet on 2nd stump
- Next action?
 - Remove any weapons or ordnance that the casualty may be carrying.
- Next action?
 - Place nasopharyngeal airway
- Next action?
 - Make sure he's not bleeding heavily elsewhere
 - Check for other trauma



Convoy IED Scenario

- Next action?
 - Establish IV access - need to resuscitate for shock
- Next action?
 - Administer 1 gram of tranexamic acid (TXA) in 100 cc NS or LR
 - Infuse slowly over 10 minutes
 - **Only for SPEC OPS units**



Convoy IED Scenario

- Next action?
 - Infuse 500cc Hextend
- Next actions
 - Hypothermia prevention
 - IV antibiotics
 - Pulse ox monitoring
 - Continue to reassess casualty



Remember

- **The TCCC guidelines are not a rigid protocol.**
- **The tactical environment may require some modifications to the guidelines.**
- **Think on your feet!**



Questions?





Back-Up Slides



Anatomy of the Inguinal Region - Right Groin

Common iliac artery

Internal iliac artery

Superior gluteal artery

External iliac artery

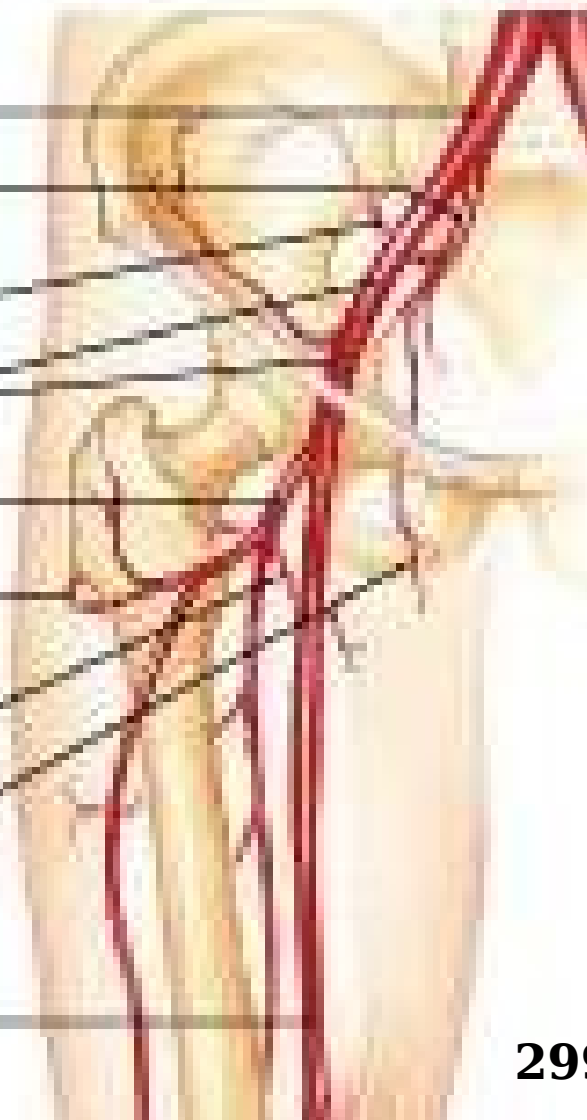
Deep femoral artery

Lateral circumflex
femoral artery

Medial circumflex
femoral artery

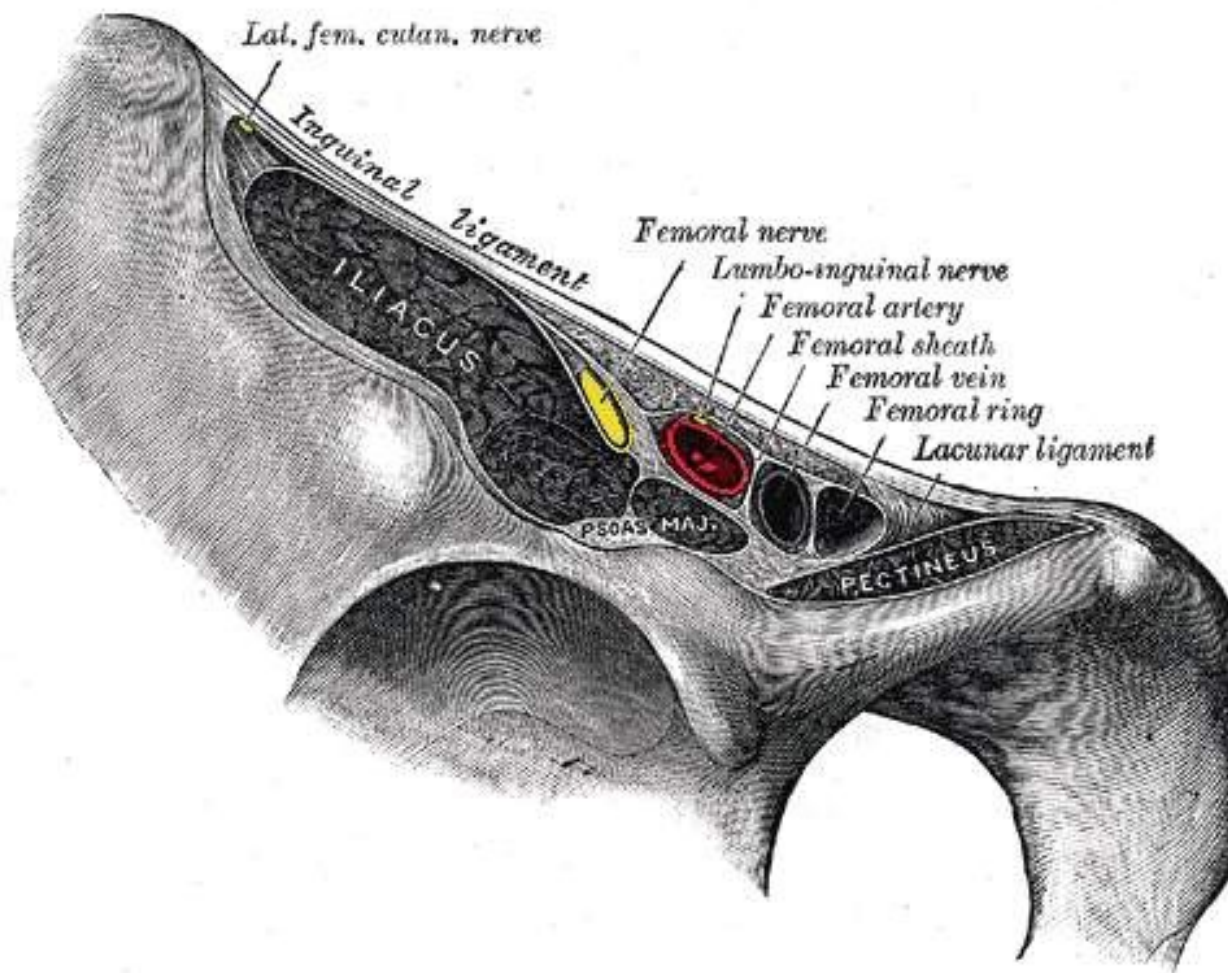
Obturator artery

Femoral artery



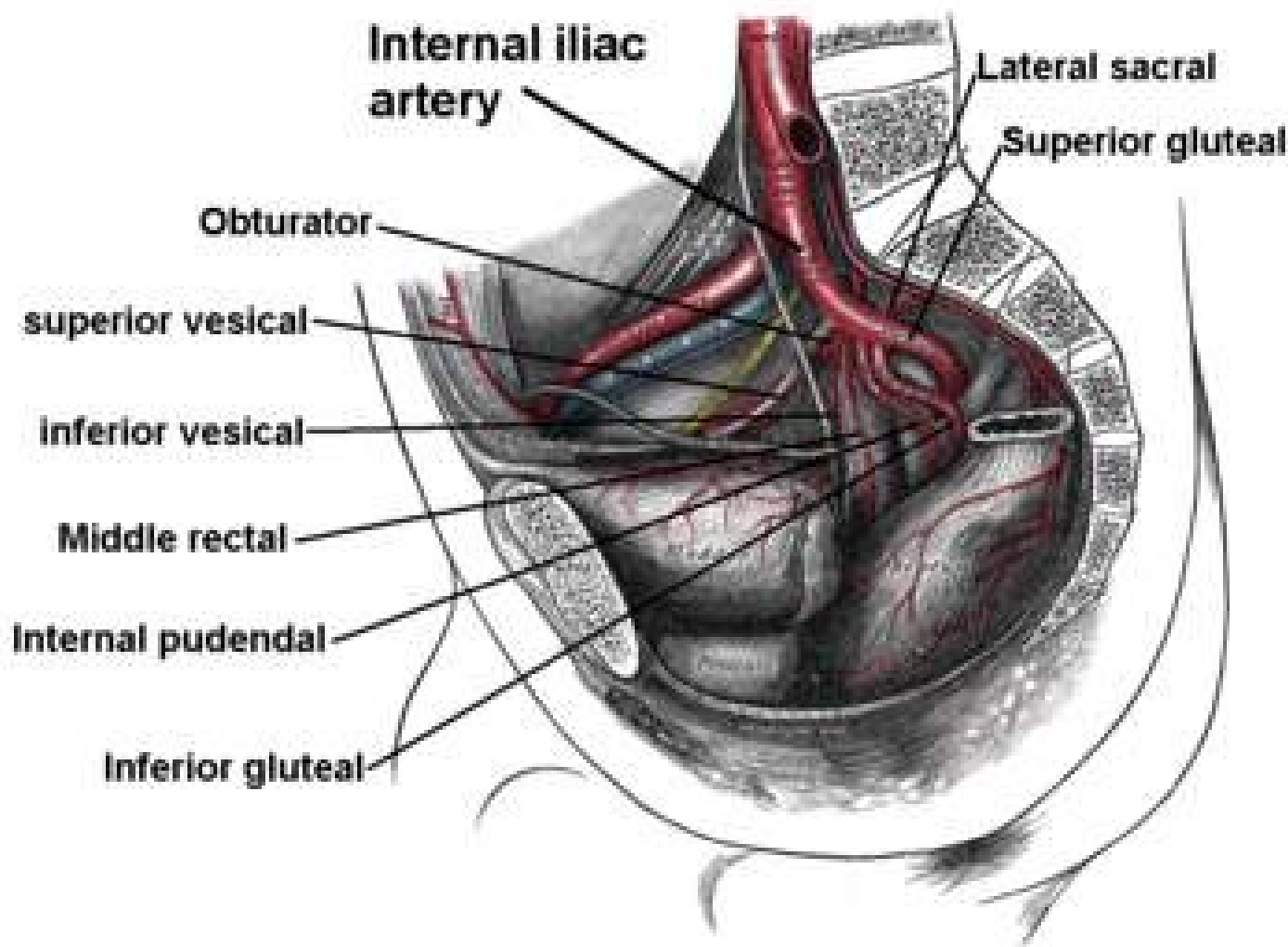


Cross Section of Right Groin at Inguinal Ligament





Anatomy of the Internal Iliac Artery and It's Branch





Removal of the CRoC

- Once applied, the CRoC *should not be removed* prior to the casualty's arrival at an MTF where damage control surgery is available.



Removal of the CRoC



- Remove the securing strap.



Removal of the CRoC



- Rotate the “T” handle counterclockwise until the disc head is clear of the casualty.



Removal of the CRoC



- Roll the casualty slightly on the uninjured side.
- Slide the CRoC off.



FAST1[®] Removal

- Remove Protector Dome
- Disconnect Infusion Tube
- Pull Infusion Tube perpendicular to the manubrium in one continuous motion. Pull the tube, not the Luer lock. **It is normal for the tube to stretch.**
- Remove Target Patch
- Apply pressure over wound, then dress site.



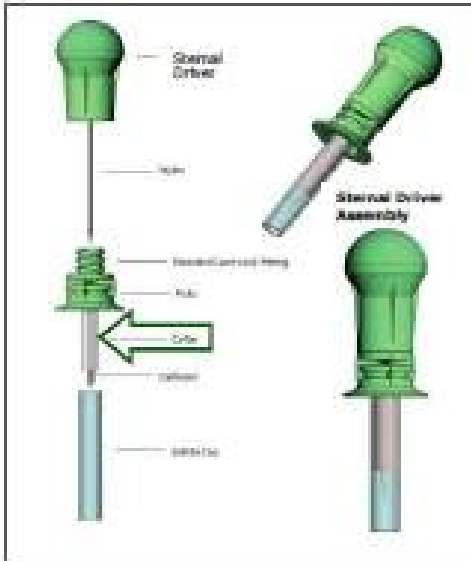


with the Sternal EZ-IO[®] Needle Set

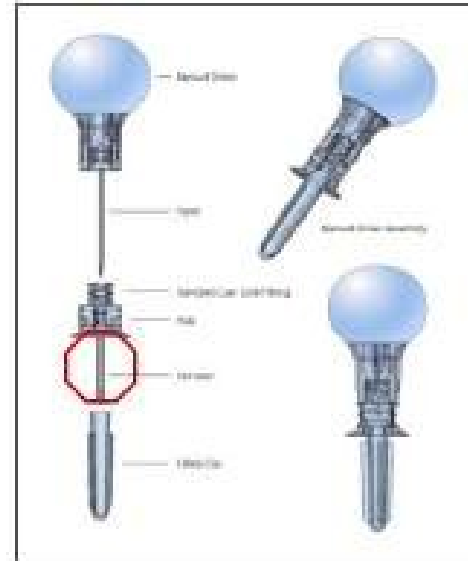




Sternal EZ-IO[®]



Sternal
Needle/Driver



Limb
Needle/Driver

GREEN = Sternal Access



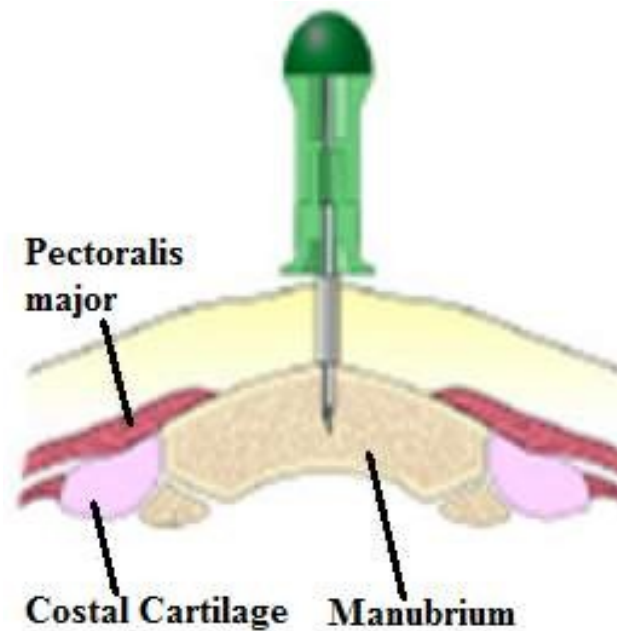
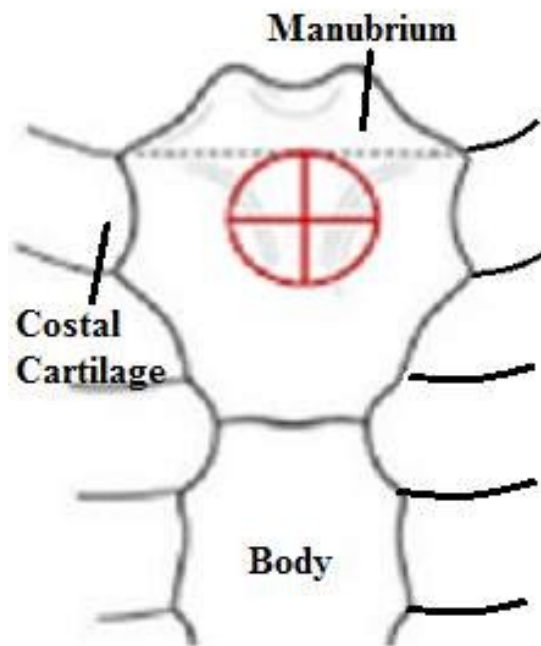
Sternal EZ- IO[®]

Contraindications:

- Fracture of the manubrium
- Previous surgical procedure
- Manubrial IO within the past 24 - 48 hours
- Infection at the insertion site
- Inability to locate landmarks or excessive tissue over the target site

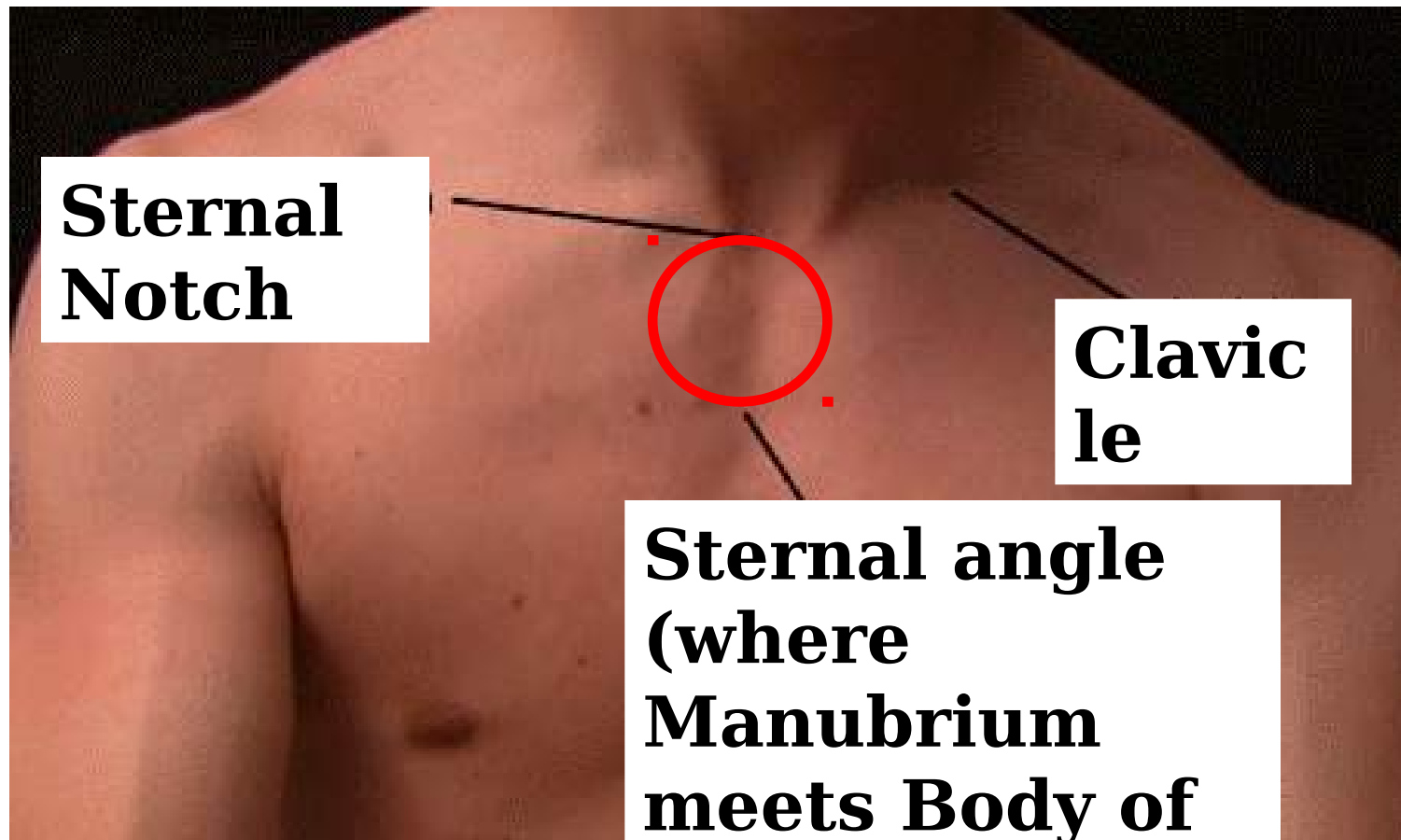


Sternal EZ-IO[®]





Sternal EZ- IO[®]





Sternal EZ-IO[®]

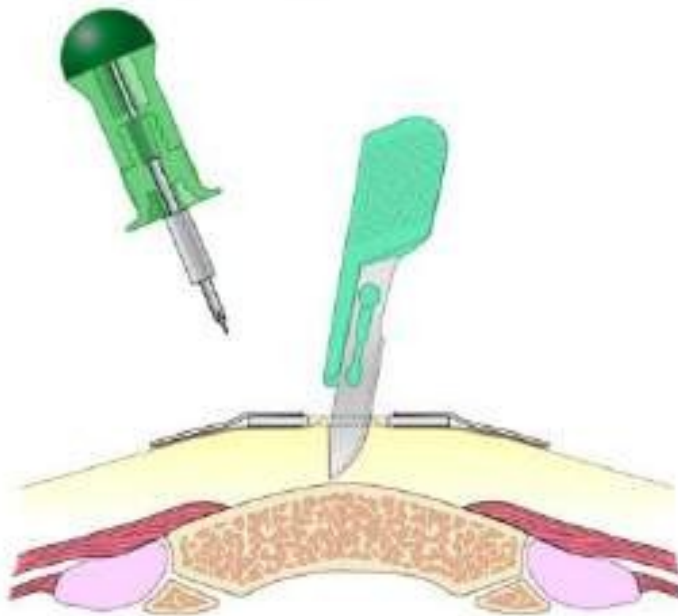
Sternal Locator





Sternal EZ-IO®

Make an incision over the insertion site.



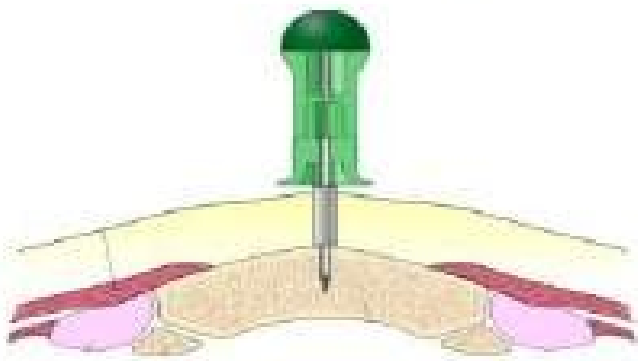
**Use the lancet provided in the needle set.
Insert it all the way down to the bone.**



Sternal EZ-IO[®]

Insert sternal needle.

Insert needle through incision.



Twist gently clockwise and counterclockwise.



Sternal EZ-IO[®]

Remove the Stylet



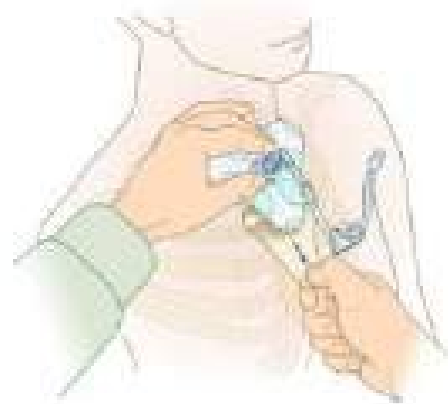
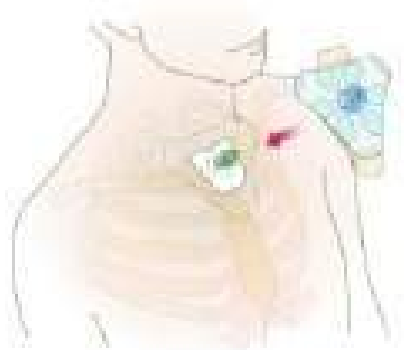
Manually stabilize the hub.

**Rotate the stylet
counterclockwise, then pull it
out.**



Sternal EZ-IO[®]

Apply the Stabilizer

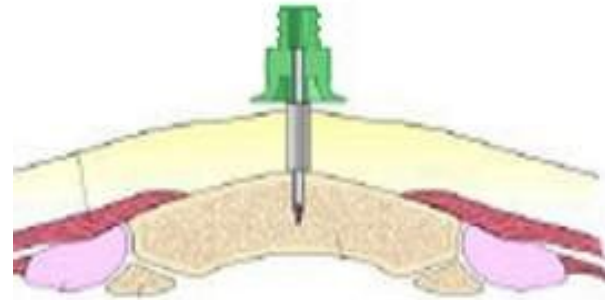




Sternal EZ- IO[®]

Confirm Catheter Placement

- **Firmly seated catheter**
- **Flash of blood or blood on aspiration***
- **Pressurized fluids flow freely**
- **Pharmacologic effects**

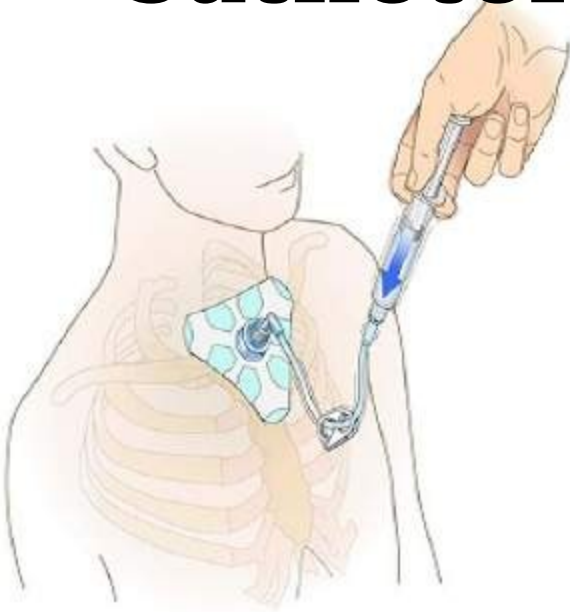


* May or may not be able to aspirate blood.



Sternal EZ-IO[®]

Flush the Catheter



- **Connect syringe to primed**

Extension Set

- **Flush with 10ml normal saline**

- **Multiple flushes may be needed**

- **NO FLUSH = NO FLOW**



Sternal EZ- IO[®]

Infuse Fluids with Pressure

- The pressure in the medullary space is about 1/3 of the casualty's arterial pressure.
- Pressurizing fluids for infusion is required to achieve maximum flow rates.





Sternal EZ-IO® Removal

- Remove the EZ-Connect Extension Set and Stabilizer.
- Attach a Luer lock syringe directly to the hub.
- Rotate the syringe clockwise while slowly and gently pulling straight back.
- Maintain axial alignment – DO NOT rock the syringe.
- Remove the Sternal Locator.